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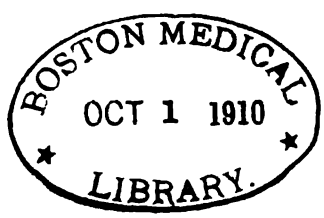

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THE SERUM TREATMENT OF PURULENT PROCESSES[1]

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UPON the advice of my chief, Hofrat Prof. Dollinger, I undertook, some time ago, to investigate the practical value of the antiferment treatment. One hundred and sixty carefully observed cases form the basis for my communication.

Because of the limited time, I must here omit the details of the methods of application of the treatment. I take it for granted that the technique of the procedure, whether by puncture, serum irrigation, or serum packs, etc., is known to all, and I will present only the important facts of my work as briefly as possible.

I will first present my clinical observations.

I

ABSCESSES OF THE SOFT PARTS

A. *Favorable aspects of the treatment.*

In the treatment of abscesses of the soft parts (128 cases), "the domain of antiferment treatment," as Müller has said, I was able to observe the following advantages.

1. *The manner* of the procedure is very simple and can be done in a very short time (4 to 5 minutes).

The seat of operation is painted with tincture of iodine, thereby accomplishing the sterilization preparation of the patient in a few seconds. Instead of opening the abscess by a large incision it is simply punctured with a strong aspirating needle and the contents aspirated with a syringe. Repeated injections and aspirations of the abscess cavity with serum are then made, thereby thinning the thick pus and allowing a more thorough cleansing. The abscess cavity is then injected with clean serum — a quantity amounting to about one-third to one-half as much as the aspirated pus. The point of puncture is then covered with gauze and adhesive plaster. Only in the more severe acute processes is a Burrow's hot pack indicated.

2. *The healing* of the abscess proceeds rapidly and definitely. To this there is one exception, however, and that is in the large deep-seated abscesses. (See indications later.)

The patient's pain subsides, as a rule, immediately after the puncture. The fever abates. The signs of inflammation, œdema, the accompanying lymphangitis, etc., have usually subsided by the next day, and occasionally have disappeared altogether.[2]

Internal healing of the abscess accompanies the improvement of these external signs. The suppurative process ceases, the dead tissues separate and are either aspirated (after they have been diluted with serum) at the time of the next puncture, or they spontaneously evacuate through a fistula later on. The content of the abscess remains cloudy or bloody for one to two days. After this time it is

[2] As a ferment serum I used sterile, generally "hochwertige," ascitic fluid, more seldom hydrocele fluid, and lately Merck's leucofermantin.

[1] Read in the Seventh Surgical Section of the International Medical Congress at Budapest, August 28 to September 4, 1909. Authorized translation from the German through J. B. Murphy, M. D., by Lawrence L. Iseman, M. D., Chicago, Illinois.

usually a clear, clean serum in the smaller abscesses, but in the larger ones it does not become clear until after repeated aspirations. The clear serum is sterile, as is shown by bacteriological examination.

The few leucocytes which can be found microscopically in the serum show an increased phagocytic power.

3. *The after treatment* was apparently simple. The repeated, more or less painful, changing of dressings which is required after the incision method is avoided. It is necessary to see the patient only once or twice.

In over one-half of my cases I accomplished my result with but a single puncture. In one-third of the cases a second puncture was required, and in the largest (with over 100 cc. of pus) abscesses only was I compelled to puncture three to five times.

4. *The duration of the treatment* in most cases was a comparatively short time when one considers the methods formerly used. The duration bore a direct relationship to the size of the abscess, i. e., to the quantity of pus aspirated.

The duration of the treatment in abscesses containing:

1 to 5 cc. of pus was on the average of 3 days.
5 to 10 cc. of pus was on the average of 4 days.
10 to 15 cc. of pus was on the average of 5 days.
15 to 20 cc. of pus was on the average of 10 days.
20 to 25 cc. of pus was on the average of 11 days.
50 cc. — 1½ litres was on the average of 8 days to 5 weeks.

It is therefore evident that the duration of treatment, at least in the small and smallest (those containing 1 to 5 cc. of pus) abscesses was definitely shortened. In the larger (containing 2 to 15 cc. pus) the duration of the treatment was not so pleasing; while in the largest (with 50, 100 and more cc. pus) the treatment lasted as long as the former methods. We must present these points as well founded before we can outline the exact indications for the antiferment treatment.

In this connection a few words concerning the *duration of the healing process* may suffice. At all events this time is shortened, notwithstanding the fact that in our closed method the exact moment of anatomical healing cannot be determined with certainty because of the overlying tissue. The subsiding of the clinical manifestations is no satisfactory criterion as to the exact condition of the interior of the pus cavity. My opinion is that in most cases an anatomical healing has not yet taken place at the termination of the treatment. Such is possible only some days later.

As one advantage of the closed method of treatment one might mention that most of the cases can attend to their accustomed duties during the whole course of their treatment without any fear of aggravating their disease, and, what is more, at the cessation of the treatments they can await the complete restitution of function without medical assistance. A continued medical control is necessary only so long as local inflammatory signs (fever, rapid pulse, etc.) are present.

Healing is not influenced one way or the other by the species of the bacterial invader present: staphylococcus, streptococcus, diplococcus, colon b., etc.

5. *The cosmetic result* is excellent. In the female sex especially, and particularly with the abscesses of the face and neck, the avoidance of the disfiguring scar cannot be too strongly emphasized.

Anyone who has been witness to the fact that abscesses in this region (size of a plum and even larger) disappear at once with a single treatment and without any external signs of any interference, will more reluctantly dispense with this method in this class of cases.

6. *The functional result* is better — and this is true for two reasons:

a. Because in the puncture treatment the scar formation, which follows the incision method, and eventually the scar disfigurement, is avoided.

b. Because the injected antiferment, through its physiological action, does not permit a further progress of the purulent softening which would lead to a larger spreading scar formation.

Almost all my cases healed ideally without scar formation under the antiferment treatment.

B. *Unfavorable aspects of the treatment.*

As disadvantages of the method I observed:

a. Immediately after the treatment:

1. *Pain* in the region of the abscess. This

can be prevented if one omits the addition of an irritating preservative to the antiferment solution, and also if overdistention of the abscess by an over quantity of serum is avoided.

2. *Headache and dizziness* I observed only once. These symptoms disappeared in twenty-four hours.[1]

3. *Chills* immediately after the treatment I observed in three cases. Usually the chills made their appearance several hours after the puncture. The next day this condition was normal.

4. *Acceleration of the pulse;* observed once and continued throughout the treatment.

b. Unfavorable aspects later in the course of treatment:

1. *Fistulous formation* at site of puncture. Such occurred in one-fourth of the cases, generally several days (usually four) after the puncture.

The formation of a fistula was never followed by a change in the usual course. All fistulæ closed spontaneously — usually within a week.

2. *Extension* or spreading of the abscess. In spite of every care in technique in applying the antiferment this occurred once — in an old decrepit patient with an abscess as large as a child's head on the back of his neck.

3. *Retarded absorption* of the injected serum. This takes place only when too large a quantity of serum is injected into the abscess cavity. In a case with such a complication arising one should simply aspirate the retained serum; but it should be remembered that a too early aspiration of the retained serum may lead to relapse.

In such a case it is indicated to thoroughly cleanse the abscess cavity and then inject a smaller amount of serum, rather than to fill it with too large a quantity.

4. *Pigmentation* of the skin over the abscess was observed in two cases.

5. Large local scar formation, in abscesses treated with antiferment, I observed once.

These latter two complications were still present several months after the treatment.

If these harmless complications are disregarded, then I was never able to observe any directly harmful effects from the antiferment treatment.

[1] Serum-exanthem and the symptoms of anaphylaxis, which will be mentioned later, I never observed after the antiferment treatment.

II

INFILTRATING SUPPURATIONS

In infiltrating suppurations or more diffuse inflammations, e.g., felon, phlegmon, carbuncle, diffuse phlegmonous mastitis, etc. (16 cases) I observed that a healing in such cases can be accomplished only after the infiltrating process has gone on to a well circumscribed abscess.

Otherwise, the only value of the method in these cases lies in the fact that wherever the serum comes in intimate contact with the wound,[2] the secretion ceases, the exudate and necrotic tissue become separated within a few days and the wound soon becomes clean.

The progressive course of infiltrating processes is not influenced by the serum treatment.

III

BONE SUPPURATIONS (4 cases)

In these four cases of bone suppurations the laying open of the bone focus followed by many weeks of progressive treatment with serum irrigations, serum packs, or serum injections resulted in nothing more than a cleansing of the soft parts of the wound. The process in the bone continued in spite of all this and we were after all finally compelled to adopt a radical procedure.

IV

BONE FISTULÆ (5 cases)

Bone fistulæ are subject to the same criticisms as bone suppurations.

V

FISTULÆ OF THE SOFT PARTS (7 cases)

These fistulæ, especially when they were large and superficial and therefore suitable for serum tamponade, soon showed a narrowing, a diminution of their discharge and a filling of the fistula with clean granulations.

The fact that the method fails in infiltrating and bone suppurations finds a natural cause

[2] In these cases a preliminary incision is followed by serum irrigations and application of serum packs.

in the theoretical principles which my colleague Müller has previously set forth. The antiferment serum can be effective only where it is brought into most intimate contact, on all sides, with the suppurating surface of the wound (Müller), where, in short, the antiferment chemically binds itself, by direct contact, to the proteolytic leucocyte ferment. It is not difficult to see, therefore, that certain physical conditions hinder this preliminary requisite for an effectual antiferment treatment in infiltrating and bone suppurations.

INDICATIONS FOR THE ANTIFERMENT TREATMENT

If I may draw conclusions from the above briefly quoted observations as to the exact field for the employment of the antiferment treatment I would arrange the special indications in the following order:

1. Antiferment treatment is indicated in the management of *acute abscesses of the soft parts* — with the exception of the following cases:

a. Extremely large, rapidly spreading abscesses. In abscesses containing 50, 100 and more cc. of pus we gain nothing as to the duration of the treatment, to say nothing of the trouble and expense.

b. Deep-seated abscesses. The primary focus of such abscesses is very often uncertain and cannot always be definitely determined from the clinical symptoms. Our surgical procedure is then of value only when we are certain of the original focus. The non-observance of this golden rule may lead to unpleasant surprises. I recall one case, which came for treatment, with outspoken symptoms of osteomyelitis of the thigh (femur); the suppurative process terminated in the formation of a paranephritis without any local symptoms.

c. Extreme weakness on the part of the patients. Here we dare not waste time with antiferment treatment. In the very decrepit, old persons especially, if the abscess is quite large, a rapid free incision is indicated.

d. Inflammatory tuberculous abscesses are much more easily managed by incision.

In all other cases of acute abscesses of the soft parts the antiferment treatment is a valuable and excellent ambulatory treatment.

2. In infiltrating suppurative processes the antiferment treatment is indicated only after the original diffuse process has become a well circumscribed suppuration, i. e., an abscess.

In all other cases of infiltrating suppurations the antiferment treatment is of no avail inasmuch as it does not check the progress of the inflammatory process.

3. The treatment is indicated in the management of fistulæ of the soft parts. It causes the discharge to diminish, the fistulæ fill up with clean granulations, and the subjective symptoms improve.

EXTENSION OF THE ANTIFERMENT TREATMENT ALONG OTHER LINES IN SURGERY AND RELATED BRANCHES OF MEDICINE

By carefully adhering to the above line of indications antiferment treatment can be extended along various lines in surgery.

Besides applying this new treatment in subcutaneous abscesses, lymph gland abscesses and breast abscesses, I gave it a trial in other special lines of surgery.

It gave favorable results in: abscesses of the tongue — 2 cases; inflammations of the gums — 4 cases; buboes — 6 cases; pararectal abscesses — 3 cases; peritonsillar abscesses — 8 cases; etc.

Kolatzek (Tübingen) showed recently (XXXVIII Kongress der Deutschen Gesell. für Chir., Berlin, 1909) that in suppurations of the internal organs this new method is applicable to some of the cases only. A number of cases came up for consideration — suppurations of the body cavities (meningitis, pyothorax, pericarditis purulenta, peritonitis purulenta), suppurations of the gastrointestinal tract, suppurative arthritis, purulent inflammations of the urinary tract, etc. I regret that my limited experience in these cases does not warrant me in submitting an opinion. I can only emphasize the words of Müller when he said: "It is necessary to have the consensus of results of many observers before we can conclude as to the favorable and unfavorable aspects of the antiferment treatment."

Moreover, researches on the application of antiferment treatment in other branches of medicine are not wanting.

Lenz (Breslau) gave the method a trial in diseases of the eye; A. Fuchs (Breslau) reported favorable results in gynecology. My results with abscesses of the tongue, inflammation of the gums, peritonsillar abscesses, and buboes speak favorably, at least, for the application of the method along the lines of stomatology, laryngology, and urology.

EXPERIMENTS TO SUBSTITUTE SOME OTHER REMEDY FOR THE ANTIFERMENT PROCEDURE

A further question of a *practical* significance is whether or not it is possible to advantageously substitute some other remedy for the antiferment treatment, and other solutions for antiferment sera.

A simple puncture of the abscess is practicable only in very small abscesses (1 to 2 cc. of pus) and even then it is not always effectual.

Physiological salt solutions (0.9 per cent) do more harm than good. Injection of large quantities often causes an increase of all the inflammatory phenomena.

In using the salt solution I obtained better results when I added a very small quantity (0.001 to 0.01 per cent) of calcium chloride to the salt solution — a fact for which Hamburger and Hekma found a theoretical reason. They observed that the addition of small quantities of calcium ions to physiological salt solutions stimulates phagocytosis.

It also seems plausible that the addition of calcium to physiological salt sol. removes the toxic effect of the sodium chloride upon the cells (Loeb).

Injection of animal sera (horse serum, cow serum) is accompanied by very severe reactionary phenomena. With these symptoms appears a hyperleucocytosis and an increased phagocytic defense — as has been shown by the extensive researches of Fejes (Budapest).

I used animal sera in experimenting on over 100 cases of purulent processes, and I succeeded finally in determining the dosage of the animal serum in order to get the desired clinical effect. A simple cleansing of the abscess cavity suffices to call forth a sufficient leucocytosis to affect the healing and still prevent the severe reactionary symptoms of larger quantities.

If one wishes to have a more marked inflammatory reaction he needs only to inject a few cc. (1 to 5) of animal serum into the abscess cavity. Such larger doses of animal sera were used in the treatment of tuberculous processes.

The physiological treatment of suppurating processes is not a new procedure in surgery. Only recently von Mickulicz adopted it in his nucleic acid treatment, and Bier in his hyperæmia treatment. These methods are closely related to the antiferment serum procedure of Müller, Kolaczek and Preisser. The treatment of suppurating processes with physiological solutions and animal sera, of which I have previously made mention, also belongs to this same procedure.

All these various methods are after all identical. They do not imitate the physiological defense in every particular but only in one or another important phenomenon. They must necessarily be so, for the present at least.

An effectual, ideal method for all surgical suppurations has not yet been found, and there will not be any such method — until our present knowledge of the defensive mechanism of the organism is enlightened; until the minutest details of the process of defense against infection is thoroughly understood; nor so long as we do not, in short, fully understand the complicated mechanism of physiological defense in all its phases.

Only upon such a basis will we be in a position to effectively aid the natural healing mechanism in all surgical infections.

This would be an ideal physiological management. For the present it is only a prospection, for such a procedure can be built up only upon the basis of most extensive researches on physiological wound treatment.

Our course appears therefore to be the correct one. To our honorable colleague, Dr. Eduard Müller, belongs the honor of introducing this new procedure.

THE PRODUCTION OF SHOCK BY ELECTRIC STIMULATION OF THE ABDOMINAL SYMPATHETIC GANGLIA

An Experimental Study

By E. B. FOWLER, M. D. and R. M. PARKER, M. D., Chicago, Illinois

IN this preliminary report it is not our intention to attempt more than to state briefly some of the views held with reference to shock, and to report our work in this field.

Fischer some two score years ago gave a classical description of shock ("traumatic shock" so-called) produced suddenly by a blow on the abdomen. Traves was perhaps the first to picture for us what has been called, for lack of a better term, surgical shock, a condition seen during or after a surgical operation with a more gradual onset than the case described by Fischer. Fischer's case might possibly have been called by Crile one of collapse, for he hold that shock is caused by stimulation of the vasomotor center to the point of exhaustion, which is the cause of failure of blood pressure and this failure brings about the clinical picture known as shock. Crile makes a distinction between shock and collapse. He holds that the onset of shock is slow, collapse is sudden; shock is not amenable to stimulation, collapse is; the vasomotor center in shock is exhausted, in collapse it is not. On the contrary Buerger and Churchman seem to use the terms shock and collapse as representing the same thing.

W. H. Howells considers shock is due to inhibition of the vagus and vasomotor centers of the medulla. S. J. Meltzer does not agree with Crile's vasomotor exhaustion conclusions but he believes that shock is produced by stimulation of the various inhibitory nervous mechanisms giving a state of inhibition but not exhaustion. However we are not sure that there is any great difference in the experimental results obtained by Crile and Meltzer but perhaps only a difference in standard as to when shock can be said to exist. Meltzer, Buerger, Churchman, Howells, many surgeons and others, would, we believe, consider a state of shock existed at a time when Crile would hold that it was not yet fully established.

March, 1907, Surgery, Gynecology and Obstetrics published the report of an experimental study by Buerger and Churchman entitled "The Coeliac and Mesenteric Plexuses and their Role in Abdominal Shock."

Searching for an answer to the question, "What is the role, if any, of the abdominal sympathetic in abdominal shock?" these authors decided that collapse or shock can not be produced in warm blooded animals by irritation of the abdominal sympathetic ganglia. The chief aim of their work was to determine under what circumstances it is possible to cause a condition of shock or collapse by irritation of the abdominal sympathetic ganglia. After inducing a moderate degree of peritonitis in dogs by injecting turpentine into the peritoneal cavity, Buerger and Churchman found that the animals would succumb to shock when their mesenteric and coeliac ganglia were stimulated with a moderately strong electric current. At the same time control animals invariably lived when they were subjected either to the electric stimulation or to the peritonitis.

These investigators concluded "that the stimulation of the ganglia was in some way or other responsible for the palsy of the higher centers in the medulla," and they thought it probable "that the continued irritation of the nerve centers, by way of the sympathetic, gradually produced a condition of exhaustion incompatible with a continuance of their function." The authors felt that the extent of their work did not warrant more definite conclusions than this, and they suggested further experimentation along this line.

The question arose with us, "Are there not insults to the animal organism other than peritonitis, which will so sensitize the nervous system that, when further stimulated through the abdominal sympathetic by an otherwise harmless electric current, its function will be destroyed?" An answer to this question has been the aim of the following experiments.

As our technique varies somewhat from that of Buerger and Churchman we will state briefly our procedure. Ether anæsthesia was used. A preliminary dose of morphine gr. ¼ to gr. ⅔ was given hypodermatically. The abdomen was shaved, scrubbed with turpentine, soap, and water and then with 2 per cent compound cresol solution. The incision, 3 to 4 inches long, was an inch to the left of the median line, parallel to the rectus and began posterior to the costal arch. A speculum which we devised was of great aid in maintaining a free field while we manipulated the ganglia. It consists of a hollow cylinder 5 inches long, 3 inches in diameter at one end, and 1½ inches at the other. The speculum was improvised from common sheet tin.

The ganglion was first isolated, the viscera held aside by fingers or retractors, and the small end of our speculum was pushed down to the posterior abdominal wall and placed so as to bring the ganglion in the center of the field. The retractors were then removed while the speculum was held in place by slight pressure on the rim. This gave three free hands with which to manipulate electrodes and other instruments.

Aided by the anatomical description of Buerger and Churchman we readily found the ganglia. Contrary to their procedure, however, we found, in nearly all of our animals, the superior mesenteric ganglion more accessible from the left side of the mesentery than from the right.

Our experiments, numbering 29, were performed in the laboratory of Northwestern University Medical School. The early experiments were not uniform in procedure but they were of value in perfecting our technique and in suggesting the lines to be followed later. They are here given in brief for the sake of completeness.

No. 1. Weight 15 pounds. Right and left coeliac and the superior mesenteric ganglia dissected out. Dog was killed immediately for purpose of study.

No. 2. Weight 17 pounds. The three ganglia isolated. Left coeliac and superior mesenteric stimulated with 20 miliamperes for 15 minutes, right coeliac 5 minutes. Dog died during night from shock. Room cold.

No. 3. Weight 25½ pounds. Left coeliac and superior mesenteric found with difficulty on account of distention of stomach and bowels with gas. A small vein between the ganglia was wounded, and hæmorrhage was troublesome. Intestines were much mauled and exposed. Room very cold, far below 50°. Dog died within 24 hours. Much blood found in peritoneal cavity. Cause of death, hæmorrhage and shock.

No. 4. Weight 20 pounds. Intestines much mauled in finding right coeliac ganglion which was stimulated 5 minutes with 20 miliamperes. Left coeliac and superior mesenteric each stimulated 7 minutes with 40 miliamperes. Room temperature low, below 50°. Dog died within 24 hours from shock.

No. 5. Weight 19½ pounds. Left coeliac superior mesenteric and right coeliac stimulated 5, 8, and 6 minutes respectively with 20 miliamperes. Intestines much manipulated and exposed. Room cold, about 50°. Time 1 hour 40 minutes. Dog died within 10 hours from shock.

No. 6. Weight 27½ pounds. Left coeliac and superior mesenteric each stimulated 6 minutes with 20 miliamperes. Right coeliac not found. Time 1 hour 40 minutes. Room 50° or below. Dog made good recovery, and was well 10 days later.

No. 7. Weight 17 pounds. Right and left coeliac and superior mesenteric ganglia each stimulated 10 minutes with 20 miliamperes. Ether anæsthetic 50 minutes. Chloroform for rest of operation. Time 1 hour 10 minutes. But little effort to find ganglia. Room temperature 70°. Animal lived 52 hours. No hæmorrhage infection or pneumonia found at autopsy. Cause of death not ascertained.

No. 8. Weight 17 pounds. The three ganglia each galvanized 10 minutes with 20 miliamperes. Time 55 minutes. Room temperature 70°. Dog died 9 days later from bilateral empyema.

No. 9. Weight 14 pounds. Each ganglia stimulated 10 minutes with 20 miliamperes. Intestines manipulated violently and exposed throughout operation. Time 1 hour 15 minutes. Temperature 70°. Dog died on 4th day from wound infection and general peritonitis.

Our first six experiments were done through the coldest spell of the winter. The operating room was on the top floor where there was an unobstructed sweep of the wind, and as we worked in the morning before the building could be thoroughly heated, the room temperature was very low. During the first six operations no record of the temperature was made as we were not thinking of the effect of the cold on our subject. We believe an estimate of 50°, or below, conservative.

It will be seen on reading the protocol that dogs 2, 3, 4, and 5 died promptly after the operation, at least within 48 hours. In absence of any other cause of death discoverable at autopsy, we feel justified in assuming that they died from the shock of the procedure.

Inasmuch as Buerger and Churchman found that dogs lived with the same stimulation of the sympathetic ganglia that killed these four dogs it occurred to us that the low temperature might be responsible for the death of our animals. To test this theory we performed experiments 6 to 9. We followed as nearly as possible the technique of the four preceding. In some of them we purposely manipulated the intestines violently and exposed them in order to imitate our unskilled efforts of the earlier operations. Conditions appeared to us no more favorable to the animals save in one respect, a higher room temperature. Yet in these experiments, 6 to 9, inclusive, the dogs survived the first 48 hours succeeding the operation, and, if they succumbed at all, it was from some complication other than shock.

The climatic conditions did not permit us to experiment further in a cold room so we attempted to chill the animals artificially as follows.

No. 10. Weight 11¾. Small intestines exposed and sprayed with ether for three minutes. Compressed air tank used. Pressure 18 to 20 lbs. Atomizer tip held 2 to 3 inches from bowels. Intestinal peristalsis quite active for a moment under the spray then remained passive. Intestines became cold to the touch, and gradually assumed a deep livid color. The veins became so congested that they stood out prominently from the mesentery and had a full tense resistance like arteries but were of a blue-black color. The arteries and capillaries were displayed in striking contrast to the veins, having a brilliant scarlet color, and they also were greatly distended. The whole picture resembled closely that seen in a cadaver, the vascular system of which has been well injected with blue and red material.

The three ganglia were now galvanized with 20 miliamperes for 10 minutes each. The intestines were left exposed throughout the operation and felt quite cold when returned to the abdomen. The animal required but little anæsthetic and before our instruments were dried he got up and staggered about the room. Time 50 minutes. Room temperature 70°. Dog died ten days later in a very emaciated condition, weight 8¾ lbs. Ate very little after operation. Cause of death not discoverable at autopsy.

No. 11. Small intestines exposed and sprayed 9 minutes with ether as in No. 10. Bowels promptly contracted to one half former caliber, darkened in color and became congested as in No. 10, but not to so marked a degree. The mesenteric arteries pulsated violently. The temperature of the bowels was well maintained in spite of the cold spray. After 4 minutes' exposure to the ether spray small hæmorrhages were noticed in the mesentery. They varied in size from a millet seed to a wax bean. After the spray was stopped the intestines returned to original caliber. Each ganglion was stimulated 10 minutes with 20 miliamperes. Time 1 hour. Room temperature 70°. Dog died at end of three days. Infection of abdominal wound and peritoneum was the cause of death.

No. 12. Weight 21½ pounds. Each ganglion stimulated 10 minutes with 20 miliamperes. Intestines exposed throughout. Ether spray to intestines 10 minutes. Peristalsis active all the time spray was applied. Before the spray was started venous stasis was present, and a few small hæmorrhages in the mesentery were noted, evidently due to manipulation. Intestines did not shrink noticeably. Before they were replaced their color brightened and the fine capillaries on the gut stood out prominently as in 10 and 11. Room temperature 75°. Time 1 hour 15 minutes. Dog lived at least 48 hours. Further history unknown.

The animals did not suffer so severely from shock when their intestines were sprayed with ether as we expected. Yet our belief in the cold operating room as a contributing factor in shock is not dispelled. It is readily appreciated that the ether spray, while producing a severe chilling, was active but a few minutes and was applied to the intestines alone, while in a cold operating room the whole surface of the body as well as the intestines was exposed to a low temperature throughout the operation.

Our next task was to determine the effect of an electric current when applied to the abdominal sympathetic ganglia of a dog after he has lost a definite amount of blood. We prepared and anæsthetized the animal in each instance as previously described. The blood was withdrawn from the mesenteric vessels just before the galvanization of the ganglia. A fair sized mesenteric artery with its veins was selected. The vessels were held taut over the finger and snipped two or three inches from the bowel with the point of a scissors, care being taken not to perforate the mesentery, an accident which allows hæmorrhage from both sides of it and makes it difficult to collect all the blood.

Before the blood was abstracted the animal was weighed, and the amount of blood to be withdrawn was computed by taking a definite per cent of the body weight.

It was usually necessary to bleed from three or four arteries before the desired amount of

blood was abstracted. After withdrawing the blood the vessels were ligated by catching the bleeding points with a hæmostatic and pulling the mesentery out like a cone. A catgut ligature was then thrown around and tied far enough from the forceps to catch both ends of artery and veins. In using this technique we never observed that the intestines suffered in nutrition.

Our first experiment of this series was to determine how great a loss of blood the animal could suffer and yet survive after each of the abdominal sympathetic ganglia was stimulated ten minutes with a 20 miliampere galvanic current.

No. 13. Weight 27¼ pounds. Four ounces blood, a trifle less than 1 per cent of body weight, withdrawn. Right and left coeliac and superior mesenteric ganglia each stimulated 10 minutes with 20 miliamperes. Time 1 hour 15 minutes. Animal survived hæmorrhage and shock dying 3 days later from suppurative peritonitis.

No. 14. Weight 12½ pounds. Blood withdrawn 3½ ounces, about 1½ per cent of body weight. Ganglia stimulated as before. Room temperature 73°. Time 1 hour 15 minutes. Dog died within 36 hours shock and hæmorrhage.

The next experiment was done as a control to the last.

No. 15. Weight 14 pounds. Blood withdrawn 3¼ ounces; 1½ per cent body weight. Each ganglia raised on electrode and held 10 minutes but not stimulated. Room temperature 70°. Time 1 hour 15 minutes. Dog died 5 days later from peritonitis.

No. 16. Weight 14½ pounds. Blood abstracted 3¼ ounces; 1½ per cent body weight. Each ganglia galvanized 10 minutes. Time 1 hour 10 minutes. Room temperature 60°. Dog lived 18 days. Died from obstruction of bowels.

This animal having survived the loss of about 1½ per cent of body weight in blood together with stimulation of the sympathetic ganglia, the amount of blood withdrawn was increased to 2 per cent of the body weight. This proved to be the right amount for our purpose.

All the following operations were as uniform as possible. All the dogs were bled 2 per cent of the body weight. Each ganglia was elevated on an electrode. In one set of animals 20 miliamperes was applied for 10 minutes. In the other, the control set, the ganglia were elevated on the electrode in exactly the same manner and held there for the same length of time but received no current.

No. 17. Weight 12 pounds. Poorly nourished, eczema of scrotum. Blood abstracted 3¾ ounces; 2 per cent. Ganglia stimulated. Time 1 hour 10 minutes. Room temperature 84°. Dog died within 24 hours. One and a half ounces of blood found in peritoneal cavity, a ligature having slipped from a mesenteric vessel.

No. 18. Weight 19 pounds. Blood abstracted 6 ounces. Ganglia galvanized. Loops of intestine exposed during early part of operation became quite cool to the touch. Rectal temperature 91.4 toward end of operation. Room temperature 68° Dog died within 6 hours as direct result of operation.

No. 19. Weight 18 pounds. Blood withdrawn 5¾ ounces; 2 per cent. Ganglia not stimulated. Time 1 hour 10 minutes. Room temperature 70°. Rectal temperature at start 100.4; at close 98.6. Dog alive and in excellent condition 1 month later.

No. 20. Weight 22½ pounds. Blood withdrawn, 7 ounces; 2 per cent. Ganglia stimulated. Temperature of dog at end of operation 94°. Room temperature 59°. Time 1 hour 15 minutes. Dog died within 36 hours from immediate effect of operation.

No. 21. Weight 11½ pounds. Blood abstracted 3¾ ounces. Ganglia stimulated. Room temperature 70°. Time 1 hour 10 minutes. Dog died within 6 hours from immediate effects of operation.

No. 22. Weight 21½ pounds. Blood withdrawn 7 ounces; 2 per cent. Wound bled freely and good measure was certainly taken. Ganglia not stimulated. Room temperature 70°. Time 1 hour 10 minutes. Dog died at end of a week from abscess of wound and local peritonitis.

No. 23. Weight 18½ pounds. Nearly 6 ounces blood withdrawn; 2 per cent. Ganglia galvanized. Much ether necessary. Dog very restless. He revived from anæsthetic quickly and staggered about the room. Time 1 hour 10 minutes. Room temperature 70°. Animal died within 48 hours from immediate effects of operation.

No. 24. Weight 18 pounds. Blood taken 5¾ ounces. Time 1 hour 10 minutes. Room temperature 50°. Dog showed marked signs of acute anæmia after bleeding. But little anæsthetic required. One week later dog was alive and well. No further record.

No. 25. Weight 21 pounds. Blood withdrawn 6¾ ounces. Ganglia not stimulated. Time 1 hour 5 minutes. Room temperature 57°. Dog alive one week later.

No. 26. Weight 14¾ pounds. Blood taken 4¾ ounces; 2 per cent. Ganglia not stimulated. Much ether used. Time 1 hour. Room temperature 68°. Dog died fourth day from peritonitis.

No. 27. Weight 11 pounds. Blood withdrawn 3½ ounces; 2 per cent. Ganglia not stimulated. Time 1 hour 5 minutes. Room temperature 62.6°. Dog lived a week or more, no further record.

No. 28. Weight 11 pounds. Blood withdrawn 3½ ounces; 2.9 per cent. Time 1 hour 10 minutes. Circumstances arose which made it necessary for both of us to work alone in this experiment. One began the operation and the other completed it. This operation was the only one in which we did not work together.

The dog lived contrary to our expectations. He may have been exceptionally resistant to the shock and hæmorrhage, or it is not improbable that there was an error in technique.

No. 29. Weight 19½ pounds. Blood withdrawn 6¼ ounces. Ganglia stimulated. Room temperature 62.6°. Time 1 hour. Dog died within 24 hours from immediate effects of operation.

In reviewing these experiments we will omit consideration of Nos. 17 and 28, since there was plainly an error of technique in the former and strong probability of error in the latter.

In experiments 18, 20, 21, 23, and 29 the animals promptly died after 2 per cent of their body weight in blood had been withdrawn and their abdominal sympathetic ganglia had been stimulated 10 minutes with a 20 miliampere galvanic current. The autopsies showed no other cause of death than the immediate effects of the operation, i. e., hæmorrhage and shock.

In control experiments Nos. 19, 22, 24, 25, 26, and 27 each animal received exactly the same treatment except that the electric current was not turned on. Yet after all these operations the dogs lived more than two days, dying, if at all, from causes other than the immediate effects of the operations.

It is evident then from our experiments that a dog by the loss of 2 per cent of its body weight in blood is rendered susceptible to death when its abdominal sympathetic ganglia are stimulated with a 20 miliampere galvanic current. This susceptibility appears to us identical with that developed by Buerger and Churchman in their animals when they induced a turpentine peritonitis.

In explanation of the death of our animals we offer the following: A dog has a limit of endurance and when that limit is exceeded he dies. While the loss of 2 per cent of the body weight in blood is not sufficient to destroy the average dog, it so weakens him that the application of a moderate electric current to his abdominal sympathetic ganglia is sufficient to turn the balance in favor of death.

Our experience convinces us that undue manipulation of the abdominal viscera and exposure of the animal to cold during the operation makes for the same result. We believe that it is immaterial whether the method of weakening the animal is by means of peritonitis, hæmorrhage, or any kind of trauma that produces the requisite shock, and that it is immaterial whether the final and fatal shock is from an electric current applied to the abdominal ganglia, or to any other part of the body, or whether the shock is produced in any other way, the result will be fatal when the dog's limit of endurance has been reached.

Our experiments have proved that a fatal shock can be produced in dogs by stimulating the abdominal sympathetic ganglia after the animals' resistance has been reduced by abstracting blood equal to 2 per cent of the body weight.

INCONTINENCE OF URINE FOLLOWING LABOR

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FOR the first few days immediately following labor one not infrequently sees in multiparous women an involuntary escape of urine on coughing, laughing, or any straining effort where the intra-abdominal pressure is increased. Occasionally long continued or permanent incontinence occurs, and it is chiefly to this class of cases that my paper will refer.

The changes in the female urinary apparatus which allow this incontinence are chiefly of the posterior urethra and neck of the bladder. The views of different authors are somewhat at variance, however, as to the causes and pathological changes found in these cases. I will cite some of them in the following paragraphs.

Scanzoni, one of the earliest writers upon this subject (Krankheiten der Wieblichen Brüste und Harnwerkzeuge, 1859), makes about the following remarks: "More frequently than narrowing of the urethral caliber one finds dilatation. As a rule the urethræ of women who have borne children rapidly one after another and as a consequence have a marked dilatation or relaxation of the vagina, are more patulous and more dilatable than in more virginal individuals. In some cases of relaxation of the vagina with dilatation of the urethra there exists a lessened power of the sphincter muscle which remains contracted in a moderately filled bladder, but when the bladder becomes very full it may momentarily relax and allow an escape of urine."

Fritsch (Veit's Handbuch, d. Gyn., bd. 11, s. 153) explains the condition as follows: The portion of the urethra which lies in immediate contact with the pubes, i. e., its upper wall, is firmly attached to the pubic arch. Should the anterior vaginal wall with its closely attached bladder sink downward there is apt to arise a dilatation of the neck of the bladder even before a true cystocele occurs. The lower wall of the adjoining portion of the urethra is likewise pulled down and this portion of the urethra also forms a part of the bladder. The canal is thus shortened and the entire pressure of the urine falls upon the lower third of the urethra, the portion which is firmly attached to the ligamentum arcuatum. If the intra-abdominal pressure be suddenly increased the shortened urethra is not capable of withstanding the pressure of the urine and it escapes. He says that in women who are short and fat and whose abdominal cavity is shortened in room from above downward the incontinence is noticeably frequent. He thinks the reason why the malady is seen more frequently immediately after labor is that at this period the urethra and vagina are hyperæmic and œdematous, and when this condition subsides the incontinence disappears. The condition according to him is not a dilatation of the whole urethra nor is it a paralysis of the sphincter vesicæ muscle.

Kolischer (Die Erkrankungen der Weiblichen Harnrohre und Blase; s. 11) says: "Another form of retrograde dilatation of the urethra is caused by the sinking down after labor of the anterior vaginal wall with its closely attached bladder, by which the lower bladder wall and the greater portion of the upper posterior urethral wall is pulled downward while the anterior urethral wall remains fixed to the symphysis. The urethra in consequence assumes a funnel shape with the greater diameter of the funnel directed towards the bladder. Thus the most important factors in the closure of the bladder, the posterior urethra and the neck of the bladder are dilated, and a relative incontinence ensues. The patient can control the urine in the recumbent posture, but in the erect posture especially in increased intra-abdominal pressure as in coughing, laughing, etc., the orificium externum alone is not capable of withstanding the pressure of the urine."

Dudley says that this form of incontinence is always characterized by a very appreciable sagging of the urethra and neck of the bladder from the pubes, and by a dilated, sacculated appearance of the urethra. The separation of the urethra from the pubes, is he believes often caused by a crushing or tearing of it from the symphysis during parturition and

that the condition is commonly associated with more or less cystocele, laceration, and relaxation of the perineum, and subinvolution of the whole vaginal outlet.

Baldwin (Amer. Gyn. & Obst. J., N. Y., 1899, XIV, 131) in reporting three cases of incontinence says: "The urethra was not dilated in any case, but even if such a condition had existed, incontinence would not of necessity follow so long as the urethra was not loosened from its fascial attachments to pubic bone, the so-called triangular or subpubic ligament. . . . .The fascial attachments of the urethra are likely always involved more than the muscular coats of the bladder or urethra in either partial or complete incontinence." He reports two cases of multiparæ in which the affection made its appearance a number of years after the last labor; and one case of a virgin 30 years old where it apparently came as a result of obstinate constipation. In all three cases he thought that he could demonstrate the detachment of the posterior portion of the urethra from the symphysis. He quotes Skene who also believed that the ailment was due to this dislocation of the posterior or bladder portion of the urethra.

Pousson reported a case where the condition came on in a woman who had borne two children. The *whole* of the *urethra* was dilated, easily admitting the little finger.

Stoeckel (Monatschr. f. Geb. u. Gyn., 1903, XVII, 1239) reports two cases of incontinence following sloughing of the bladder walls where the mucous membrane and internal middle muscular layers of the greater portion of the bladder had been destroyed. Cystoscopic examination showed the sphincter vesicæ internus to be represented by a thin, pale red fold.

The following cases of Glas and Zuckerkandl are reported because they illustrate the views of some investigators as to the etiology of the condition and not because they were dependent upon labor. Glas saw incontinence in a maiden of 16 years. The affection began at her 12th year and Glas believed it due to some defective innervation of the detrusor and sphincter muscles. There was no organic disease of the nervous system and the urethra and genitals were normal in appearance. Zuckerkandl (Gyn. Gesellsch., Wien, 1893, II) operated upon a 54 years' old woman in whom the incontinence appeared as a result of "senile genital involution."

Olshausen in a discussion in Berlin in 1895 expressed the opinion that it is doubtful if the sphincter vesicæ muscle is really responsible for the closure of the bladder and for continence. He thought that the urethral musculature does this and that the sphincter expels the last drops of urine in micturition.

Cumston (Monatschr. f. Geb. u. Gyn., 1904, bd. XIX, 538) says that the incontinence which arises as a result of lesions occurring during labor can be divided into two classes, (1) injuries due to pressure where only a slight paralysis ensues with a temporary incontinence and (2) deep lacerations with permanent incontinence.

Several cases have been reported where incontinence has followed symphyseotomy and here the condition was probably due to trauma with œdema, etc., as the incontinence as a rule disappeared in a few weeks. One reported case, however, required an operation after the condition had persisted for several months.

It is asserted by many that the condition is apt to be a result of prolapse and cystocele, but Stoeckel who examined cystoscopically a number of cases of cystocele says that he has never seen a dilated or gaping posterior urethra among them.

Pawlik expressed his belief that the sphincter vesicæ and urethræ muscles were not essential to continence and on this based the principles of his operation.

I have seen in the last five years four cases of prolonged incontinence which were the result of labor. In my first case, a multipara, the condition had existed for nine months and had been gradually growing worse. There was no incontinence when the patient was lying down but on coughing, laughing, or walking she had no control. Her last labor four years before was difficult and instrumental. The examination showed an old laceration of the perineum with gaping vagina. There was a sagging down of the anterior vaginal wall. The uterus was low in the pelvis and retroverted. The cystoscopic examination showed the urethra considerably shorter than normal with a dilated

posterior portion which showed a tendency to stand open when a Kelly cystoscope was being withdrawn. The urethral and bladder mucosæ seemed normal.

In my second case the condition came on immediately after delivery where there was a transverse presentation. Her physicians had done a version and had made futile attempts to deliver the aftercoming head. In attempting to deliver the head the forceps had slipped and one blade had caused a deep laceration along the urethra which separated the urethra partially from the symphysis. I was finally compelled to do a craniotomy. The laceration extended from the meatus nearly to the neck of the bladder. Owing to the desperate condition of the patient immediately after delivery no attempt was made to suture the laceration along the urethra, nor of the perineum where a laceration nearly down to the sphincter ani existed.

An examination made two months after delivery showed the laceration of the perineum above mentioned. The vagina was gaping, the cervix deeply lacerated, the uterus retroverted and lower in the pelvis than normal. The urethra seemed unusually prominent; instead of being in close apposition to the under surface of the symphysis it hung, as it were, by the side in which the laceration had not taken place. "Its power of contraction is partially lost as is shown by the introduction of the cystoscope, the urethra remaining open behind it so that one could see into the bladder after the cystoscope had been almost entirely withdrawn from the urethra." (Note made at the examination.) The scar tissue alongside of the urethra was quite noticeable. The incontinence had been at first complete but the patient partially regained control of the urine until another pregnancy occurred, about five months after delivery when with the increasing size of the uterus the incontinence grew more marked. She has now, three mo ths after the delivery of her second child, a rather marked cystocele and rectocele. The urethra hangs away from the symphysis downward towards the right side. It appears about one half the usual length and the actual measurement inside its canal is $1\frac{3}{4}$ cm. The same tendency to remain open is seen upon the withdrawal of the cystoscope and the whole canal is slightly larger than normal, admitting a No. 10 speculum without difficulty.

In my third case the ailment came on after delivery of a breech presentation. There was a deep laceration of the cervix extending to the right and anteriorly along the vaginal vault. The scar was very rigid and formed a raised ridge from the cervix to the pelvic wall. The anterior vaginal wall was slightly prolapsed. The degree of incontinence was less marked in this case and the urine escaped only upon straining, coughing, etc., and the condition grew gradually better in spite of another pregnancy which occurred within six months after her first labor. The incontinence has now completely disappeared. No cystoscopic examination was made in this case.

In my fourth case the condition appeared during a second pregnancy following within three months a normal delivery in which no appreciable laceration of the perineum had occurred. The incontinence persisted throughout the pregnancy and has continued to the present time. The escape of urine occurs only when she coughs, runs, or makes some effort which causes increased intra-abdominal pressure. The pelvic examination showed a relaxed and slightly gaping vagina with a slight tendency towards cystocele.

In reading the views of a number of investigators and in studying my own cases I am convinced that there is no single constant cause for the incontinence which appears after labor. We see it in women immediately after labor when the urethra is bruised, œdematous, and swollen; its posterior portion perhaps dilated by pressure of the fœtal parts against the symphysis; its nerve supply temporarily injured, and disappearing when these conditions subside. We see it, as in one of my cases, following lacerations along the side of the urethra and can account for it here by the partial cutting off of the urethral nerve supply and by the sagging condition of this structure; it did not closely hug the under surface of the pubes and did not conform to Pawlik's idea that the anterior and posterior surfaces should lie in close contact at the point of flexure. Baldwin, Skene, and Dudley think it is due generally to dislocation of the bladder portion

of the urethra from its attachment to the under surface of the pubic arch. Stoeckel believes that cystocele and dilatation of the posterior urethra are rarely if ever coexistent and clinical experience teaches that incontinence does not generally accompany cystocele. Scanzoni, Fritsch, Kolischer and others teach that this form of incontinence is due to a conically dilated posterior urethra whereby the length of the urethra is diminished and the sphincter is overstretched and weakened; that the condition is brought about by a dilated and relaxed vagina and perineum and a sagging downward of all of the pelvic orgars. My first two cases showed this dilatation of the urethra and in addition to an open, gaping vagina showed a retroversion of the uterus, a condition which frequently accompanies a beginning prolapsus uteri. Stoeckel's two cases show that the condition may be the result of actual loss of the sphincter muscle due to sloughing, and the case of Pousson would indicate that not only may the posterior urethra be dilated but that the whole canal may show this condition. Finally the cases of Glas and Zuckerkandl would teach that a defective local innervation or a senile genital atrophy may be productive of incontinence.

Treatment. The prophylaxis is in this malady as in many others very important. One needs only mention the proper conduct of labor such as allowing the complete dilatation of the cervix and the emptying of the bladder before the application of forceps; the proper application of the forceps to prevent slipping with lacerations by its blades; the timely use of forceps in the second stage of labor to prevent sloughing from prolonged pressure by the fœtal head against the neck of the bladder and urethra; the careful and immediate repair of extensive lacerations of the vagina and perineum and the preventing of infection, etc. The proper selection of cases for symphyseotomy so that there shall not be too wide a separation of the pubic bones with its consequent trauma to the soft parts is likewise important. Following labor the incontinence which at times immediately ensues needs generally give no alarm as it disappears with the subsidence of the œdema, ecchymoses, and pressure paralysis. After a few weeks the replacement of a retroposed uterus and the application of a well fitting pessary which seems not only to hold this organ in place and favor involution of the pelvic tissues but by the gentle pressure of the anterior part of the pessary against the urethra tends to cure the incontinence. Milne Murray (Edinburg Med. Jour., April, 1881) reports a case in which the ailment had lasted fourteen months following a prolonged and difficult labor which he cured by the application of a galvanic current. Others have recommended this form of treatment. Baldwin (Amer. Gyn. & Obs. Jour., N. Y., 1899, XIV, 131) relieved his three cases by means of pessaries, two by the Emmet and one by a ball pessary. Gersuny, Clerc-Dandoy (J. Med. de Brus., 1906, XI, 15), Stoeckel (Monatschr. f. Geb. u. Gyn. Berl., 1903, XVII, 1239–1241) and others report cases cured by the injection of paraffin around the urethra. Eckhardt (VI versamml. d. deutschen gynaek. Gesellsch. in Wien, 1895) exhibited an instrument which by pressure in the urethra partially relieved the incontinence. The woman could hold her urine 2½ hours at a time.

Pawlik (Zeitschr. f. Geb. u. Gynaek., 1882, bd. VIII, s. 38) describes an operation for incontinence in a very interesting article. He says that in certain cases of vesicovaginal fistula which involve the sphincter vesicæ muscle that after repairing the fistula the women still have incontinence. In one case, however, upon which he operated the urethra was entirely gone and to his surprise after its restoration by a plastic operation he found that the woman had continence. From this case he conceived the idea that the sphincter is not essential to continence. He likened the action of the urethra to an acutely anteflexed uterus where there is no sphincter and where the uterine contents are retained by the anterior and posterior uterine walls lying in close contact at the point of flexion and can be expelled only by contractions of the uterus. He endeavored to produce this condition in the urethra in cases of incontinence by bending the urethra sharply around the ligamentum arcuatum and also by pulling the urethra in tension from side to side in order to bring the anterior and posterior walls in close contact. His endeavor was to draw the anterior part of the

urethra towards the clitoris in order to produce the kinking, and the lateral tension (Querspannung) he endeavored to effect by excising a wedge-shaped piece of tissue on each side of the urethra and by suturing the sides of the urethra to the outer side of the excavation. He describes his operation as follows: The patient is placed in the knee-chest position and a Simon's speculum introduced into the vagina. Then with a tenaculum he saw how far to the left he could pull the urethra and marked this point. He then saw how far he could pull the meatus towards the clitoris and marked this point. He now excised a piece of tissue corresponding to these points and placed his sutures so as to pull the urethra forward and to the left side at the same time. After the wound had healed he did the same procedure in the opposite side. The operation was done in two stages to avoid cutting off the blood supply and thus avoided necrosis. He reported four cases with success and says the cases grew gradually better, being able to retain more and more urine as time passed.

Dudley (Jour. Amer. Med. Assoc., June 3, 1905) describes an operation devised by him which is essentially the same in principle as Pawlik's but which has the advantage of being done at one sitting. Dudley makes a horseshoe incision between the meatus and the clitoris and extending along the sides of the urethra its whole length. The urethra is drawn forward and stretched laterally by means of properly placed sutures.

Albarran operated by dissecting free the urethra and narrowing its lumen by two sutures, one placed anteriorly and one posteriorly, the application of the suture giving the cross section of the urethra a heart shaped appearance. He formed two flaps by making an incision from the meatus to the clitoris and dissecting back the tissue on either side. The meatus is advanced just under the clitoris and sutured there, and the flaps brought together under the urethra to support it.

In the Centr. f. Chir., 1889, No. 25, Gersuny describes an operation which he performed upon a girl who had congenital epispadias. She had been operated upon three times; once by Pawlik who did his advancement of the urethra, all without success. Gersuny conceived the idea of twisting the urethra so as to make the mucous membrane to lie in folds which ran spirally lengthwise the canal and in the middle of the urethra fully closes its lumen. From this point outward and inward the urethra dilates and he compares the condition to a rubber tobacco pouch in which the twist closes it. In the case just mentioned he operated three times before he got the desired result. The first time there was a rotation of 180° with primary union; the second time, a rotation of 90° with primary union; the third time, another rotation of 180°, making altogether a twist of 1¼ times. The final result was that the woman could hold her urine for hours, the bladder could retain one half a litre, and it required four minutes to empty it. The operation is performed as follows: One fixes the edge of the meatus by means of two sutures which act as guides. The meatus is encircled by an incision and the entire urethra dissected free, including as much of the surrounding tissue as possible. By means of this suture the urethra is rotated until a very small catheter can just be made to pass and the urethra is sutured in its new position. He and his followers claim that the operation is applicable to all cases where the sphincter vesicæ is wanting, is useless, or cannot be made to functionate. Stockmann, Weinleshner, (Glas), Fritsch, Hofmoki, Zuckerkandl, V. Braun and others have operated with success by Gersuny's method. One would expect necrosis of the urethra where this stricture was rotated as much as has been done in some cases, 360° at one operation, but in only one of the cases which I have been able to find was there a slight necrosis and this did not apparently interfere with the result.

Pousson (Bull. et Mem. de la soc. de Chir. de Paris, XVIII) on June 12, 1891, operated upon a woman who had borne two children and who had a much dilated urethra (it would admit the little finger) by a method which was a combination of Pawlik's and Gersuny's. He dissected the urethra free 1½ cm. towards the bladder and advanced it to the clitoris and at the same time rotated it 180°. He claimed priority over Pawlik although he reported his case later.

Schultze (Wiener Med. Blatter, 1888, XVIII

u. XIX) describes an operation for incontinence done by him first in 1878 in which he excises an oval piece from the neck of the bladder and urethra about 3 cm. long and 1 to 1½ cm. wide in the middle through the entire thickness of the septum. He sutured the edges of the resulting opening over a catheter. He was successful in curing two cases. One after the first, and the other after the third operation. Other operators have followed this method with varying success. The objection to the operation is the liability of the wound not healing in consequence of the necessity of placing a permanent catheter or of frequent catheterization. To overcome this objection it has been proposed to make a temporary vesico-vaginal fistula until healing takes place, when the fistula can be closed by another operation.

Frank (Centr. f. Gyn., 1895, s. 55) modified the operation done by Schultze in that he did not resect the bladder or urethral mucosa but removed a piece only from the anterior vaginal wall. In suturing, however, he gathered up the muscle so as to make a roll and narrow the internal urethral orifice. In this way he avoided the possible formation of a fistula. Frank, Engstrom, Lapthorn Smith and others have reported cases by this method of operating; Lapthorn Smith (Canada Med. Rec., 1898, XXVI, 531) cured a case of incontinence developing after a severe labor when "*there seemed to be no life in the sphincter*" accompanied by a large rectocele and cystocele. He operated for cystocele and tightened the sphincter by the denudation further than usual towards the meatus and gathered up the sphincter as described by Frank. A posterior colporrhaphy was likewise done at the same time. The result was described as perfect.

Van der Warker (Amer. Med., 1904, VIII, 273) recommends narrowing of the vagina just over the sphincter vesicæ but remarks that it does not as a rule cure permanently. The same method has been used by Winckel and others.

Gilliam and Fest have described an operation to tighten the external urethral opening by excising a piece of tissue on either side of it and suturing so as to bring its anterior and posterior surfaces in close contact.

I have operated only once for this form of incontinence. This was upon case No. 1 where the incontinence came on four years after her last labor and had been in existence for nine months. I operated according to the Frank method combining with the plastic operation over the posterior urethra and neck of the bladder an anterior and posterior colporrhaphy with suspension of the retroverted uterus. The tightening of the posterior urethra was so marked that the woman had to be catheterized for about two weeks but after that the urination was quite normal and now, after three years, there has been no return of the incontinence.

In conclusion I would say that the incontinence which comes on immediately after labor due to swelling, etc., of the urethra and bladder neck, as a rule soon subsides without treatment. Later one should make a careful examination of all the pelvic organs, replace a retroposed uterus when necessary, hasten involution of the pelvic structure by douches, tampons, pessaries, etc. In persistent or increasing incontinence some operative procedure is usually necessary. The nature of the operation should depend upon the condition of the urethra and bladder neck. The Frank operation, combined with an anterior and posterior colporrhaphy in cases where there is a relaxed and gaping vagina, and some appropriate operation for retroversion where this exists, will cure the average case of incontinence coming on after labor, and of not too long standing. In cases where there is a marked dilatation of the urethra and of long standing or cases where from necrosis the muscular wall of the neck of the bladder and urethra are wanting, Gersuny's operation seems to offer the best hope of cure. Pawlik's and Dudley's operation have likewise given good results at the hands of their originators.

THE SUBINVOLUTED UTERUS[1]

A Sketch of the Life History of the Uterine Musculature; an Outline of the Pathology of Subinvolution; General Plan for its Treatment. A Brief Report of Twenty-three Cases Treated by Hysterectomy

By RICHARD R. SMITH, M. D., Grand Rapids, Michigan

IN the present paper the term "subinvolution" is meant to be extended to every parous uterus which has failed to undergo normal retrogressive changes, whether the conditions be found a short or a long time after pregnancy. It is my purpose to review briefly the pathology of this condition and to outline a general plan for its treatment, hoping to stimulate among you a little additional thought and interest in this rather important subject.

The subinvoluted uterus, with its commonly associated conditions, undoubtedly causes discomfort and sometimes serious invalidism in a large number of our American women. If dealt with intelligently, however, it is peculiarly responsive to treatment and would seem to have met with less consideration in our textbooks and literature than it deserves.

As a basis of study of all diseases of the uterus, and particularly those associated with disturbances of its function, it is well to know something of its development. It is for this reason that I wish to review with you briefly the life history of the uterine musculature, before pointing out to you the changes found in the subinvoluted uterus.

The uterine musculature has been the subject of much painstaking study by a considerable number of men. To be especially mentioned, is the work of Helie, Werth and Grusdew, Roesger, Sobotta (who has taken up the matter from the standpoint of comparative anatomy), and Bayer, whose studies extended over twenty years and who has presented his results in a most attractive monograph. I shall have the pleasure of showing you a number of his illustrations. All agree that the work is still far from complete. The results of their investigations, however, are worthy of study.

We may differentiate in the fœtal uterus two morphologically and genetically different layers of unstriped muscle fibers, the inner one derived from mesodermal (until then undifferentiated cells) surrounding the Müllerian duct, a simple extension of the same structure found in the tube; the outer one derived from the connective tissue of the mesometrium and serosa and spreading over the other as a cloak. In some of the lower animals, even at maturity, we find these two layers distinctly divided. (Figure 1.) In the course of its phylogenetical

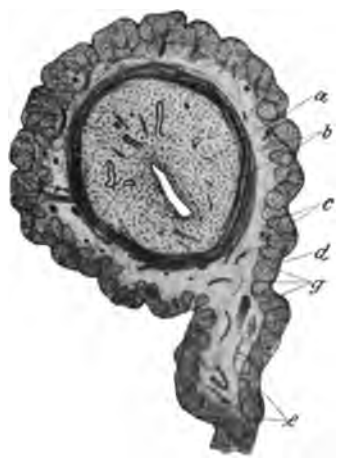

Fig. 1. Section through the uterine horn of a mouse. (Sobotta.) *a*, Mucous membrane; *b*, Circular layer of muscle; *c*, Longitudinal layer of muscle; *d*, Serosa; *e*, Ligamentum latum; *g*, Blood-vessels

development, the structure of the uterus shows a progressively intimate mingling of its fibers and in the human female — the highest type — we find in the adult any such arrangement of fibers difficult to trace. A study of the uterus in the fœtus, however, shows this primitive arrangement to be at the foundation of its structure. The first-named primordial muscular anlage — the so-called archimyometrium — is found distinctly present as early as the fifth month. (Fig. 2.) It consists

[1] Read before the Chicago Medical Society, May 12, 1909.

Fig. 2. In this section from the uterus of a fœtus of six months is shown the ring-like layer — the primitive one. The second layer has not yet assembled. (Bayer.)

mainly of circular fibers surrounding tubal lumen and uterine canal, this simple arrangement being broken by the union of the two canals as they come together to form the uterus. The second layer, or paramyometrium, of later origin, found sometimes as early as the seventh month, assembles outside of this and is composed of fibers continuous with those of the round, ovarian, and sacro-uterine ligaments and the vagina. To these are added commisure fibers, binding all intimately together and producing an extremely complicated structure. From the seventh to the ninth month there takes place a rapid advance, so that the uterus at birth has made considerable progress in development, differing quantitatively rather than structurally, from the adult organ. (Fig. 3.) At this time it measures one-twelfth of the body length as compared with one twenty-fourth of the body length found in the adult. The state of development at birth, however, varies considerably, and this variation is found chiefly in the paramyometrium, the archimyometrium remaining much more constant. Immediately

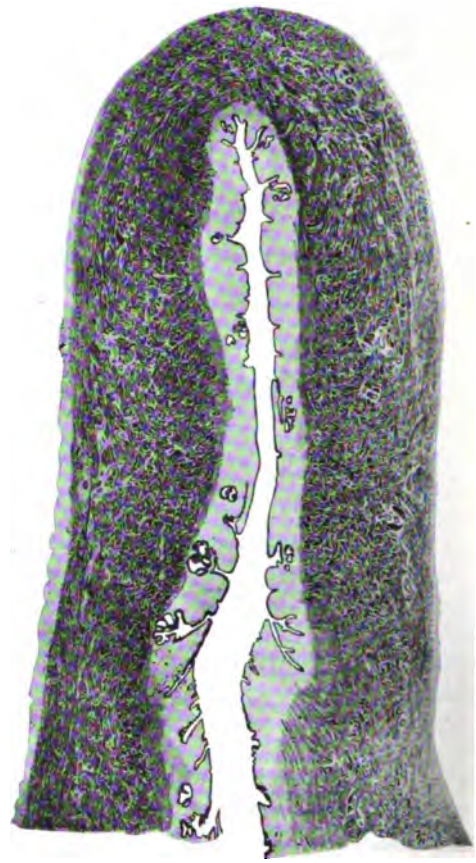

Fig. 3. The comparatively well developed musculature of a new-born infant, to be compared with that of an infant at two months, seen in Figure 5. (Bayer.)

after birth there takes place a remarkable atrophy of this structure and at the end of the first month we find the uterus smaller and the individual fibers atrophied. (Figs. 4, 5.) During childhood we miss any marked increase

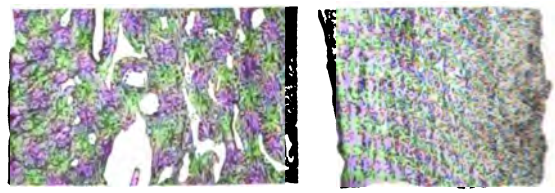

Fig. 4. On the left is a section from the uterus of a new-born infant; on the right one from an infant of one year. Note the difference in the texture of the two sections — the one coarser on account of the large size of its cells. In stained sections it is more difficult to distinguish muscle from connective tissue, the cells taking their individual stains less readily. (Bayer.)

Fig. 5. Section through the uterus of a two months' old child. Compare with Figure 3 and note the so-called post-fœtal involution. (Bayer.)

in size, but there takes place a regeneration and shortly before puberty we find the condition at birth reinstated.

Bayer differentiates two distinct types found during childhood: a well developed type, with comparatively thick body, a short cervix (Fig. 6); and secondly, an atrophic type, with short, thin body and long cervix. (Figs. 7, 8.) Many uteri are of a more or less intermediate type. The first form is associated with well developed round ligaments, the latter with much smaller ones. It is probable that the ovaries also show a corresponding condition of development. I call attention to this as showing the marked difference in uteri during childhood and the possible disturbance of function after puberty, coming from this source. (Fig. 9.)

At puberty there takes place a remarkable development of all the layers of the uterus, but more particularly the outer. The serous and subserous connective tissue is invaded with muscle fibers, the vessels come to lie deeper in the wall and increase in size. At this period in life there is also a considerable difference in such changes. (Fig. 10.)

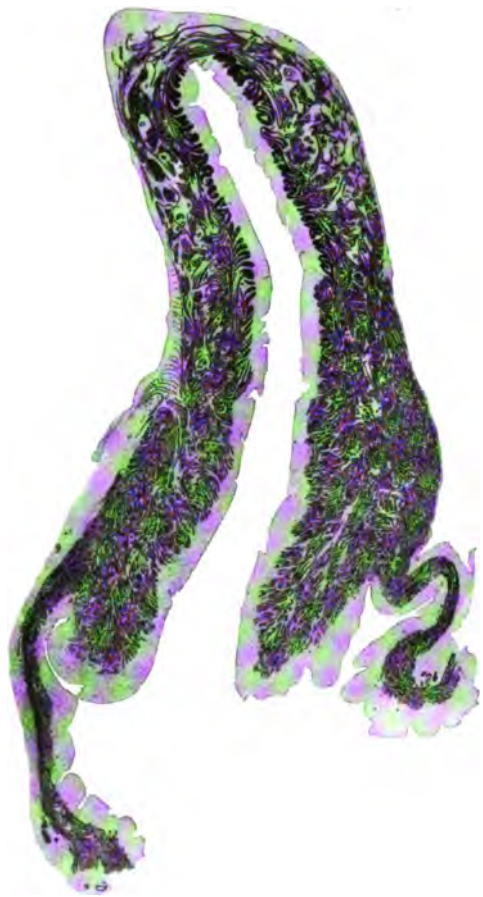

Fig. 6. Section from the uterus of a two year old infant — the well developed type. Note the comparatively thick body and short cervix. Compare with Figures 7 and 8. (Bayer.)

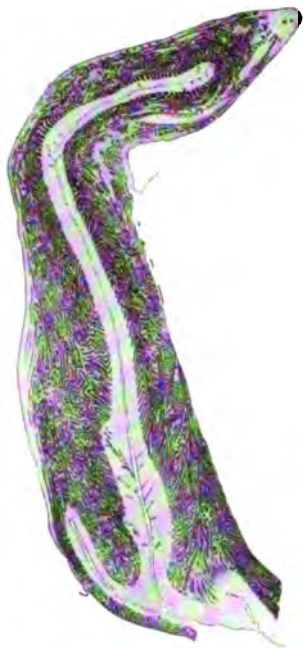

Fig. 7. Section from uterus of four year old child (atrophic type). Note great length of cervix, small body tapering to a ridge. (Bayer.)

Menstruation, subjected to great irregularities on account of perverted influences from without, requires also, for its normal course, a uterus which is more or less near the normal in structure. During menstruation there takes place, by a diapedesis, an extravasation of blood from the capillaries in the subepithelial network. This blood finds its way between the epithelial cells into the cavity of the uterus. This process is largely a passive one — the blood supplied to the capillaries is now commonly thought to be regulated by uterine contractions, which are supposed to regulate its flow by pressure upon its blood-vessels. Under ordinary circumstances this is nicely adjusted, and like most other physiological processes, may take place normally, even when the mechanical conditions are somewhat disturbed. It is easy to imagine, however, that if this control is interfered with through some mechanical imperfection, that irregularities must take place. The irregularities of menstruation, before childbearing, are now commonly supposed to be due, after allowing for the nervous system, to a disproportion of the muscular and fibrous elements of the uterine walls. Our knowledge of the mechanics of menstruation is still, however, very imperfect. (Fig. 11.)

By all odds, the most marked changes which take place in the uterus during its life history are those brought about by pregnancy. In early pregnancy they are due largely to those influences affecting many other structures of the body at this time, as may be seen by comparing the uterus of a tubal pregnancy with that of the normal. Later the changes are effected chiefly by the growing ovum. From an organ of about 6½ cm. in length, it develops to one of 36 cm. with a somewhat corresponding increase in other dimensions. Krause estimates that its capacity increases 519 times. In weight there is an increase of from 30 to 1,000 grams. There takes place an hypertrophy of

Fig. 8. Section of uterus from seven year old child (atrophic type). Note long cervix, small body. (Bayer.)

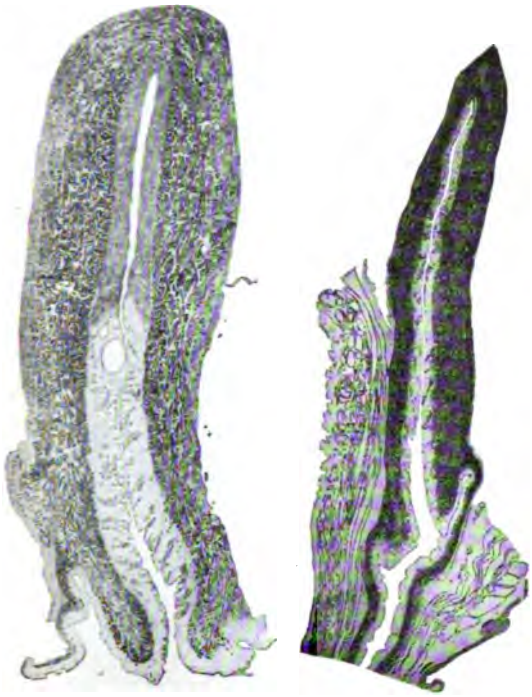

Fig. 9. Sections of uteri taken from fourteen and fifteen year old subjects, but not as yet menstruating. Note here also the difference in structure, length of cervix, and shape of body. (Bayer.)

Fig. 10. The left picture shows the infantile type prevailing after puberty; the right the better developed type. Note the slight difference in the length of the cervix, the different blood supply, and generally more robust form of the latter. (Bayer.)

Fig. 11. This is the normal, well developed uterus from a fifteen year old subject in whom menstruation has begun. (Bayer.)

the muscle cells already present and during the first few months, at least, new ones form. The individual cells, according to Williams, are from two to seven times wider and from seven to eleven times longer than in the non-pregnant state. The blood-vessels are also much increased in size and number. Under the influence of pregnancy the arrangement of muscle fibers to be found in fœtal life may be here again more or less distinctly traced. The proportion of muscular over fibrous tissue is also somewhat increased at this time.

The changes brought about by involution, as far as size goes, are principally due to those

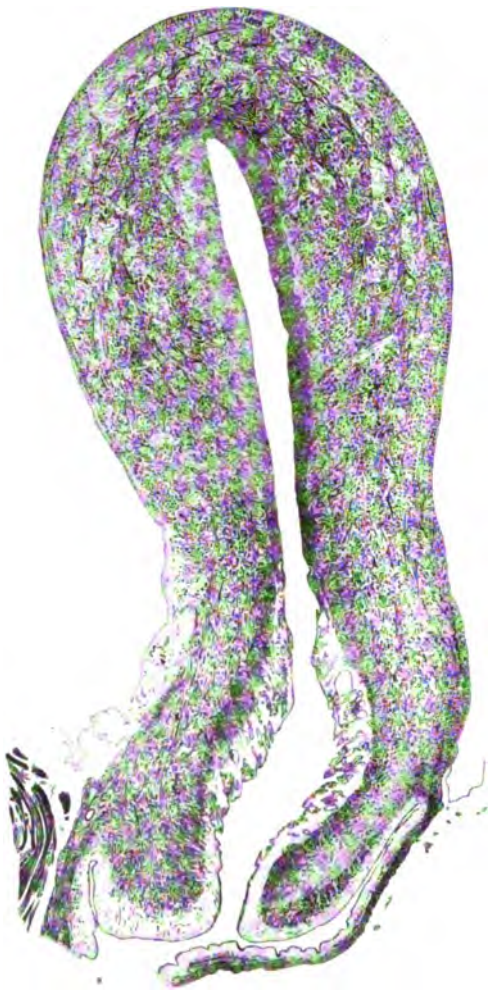

Fig. 12. Normal parous uterus from twenty-seven year old subject. (Bayer.)

found in the muscular layer. The number of cells does not materially decrease, but they lose their protoplasm and, according to Sänger are found in full involution to be one-eighth of the size found in pregnancy. Other changes take place also. The amount of connective tissue is relatively increased and the vessels undergo certain changes to be enumerated later. (Fig. 12.)

Theilhaber and Meir have studied the musculature of the uterus in regard to its connective tissue, and state that there is a slight relative increase following childbirth, and which is augmented, also, at succeeding births. Although differing somewhat in subjects, they found in childhood a proportion of about one part muscular and two parts fibrous tissue; during the period of sexual activity two-thirds muscle tissue and one-third fibrous tissue. After the climacteric the proportion is again reversed. The estimate is best made by comparing the gross appearance of specimens stained with Van Gieson's stain, either with the naked eye, or a reading-glass.

The elastic tissue of the uterus forms an important part of its structure. This has been made the subject of a special study by Pick of Germany, and by Anspach of Philadelphia, who has given us a most excellent article on the subject. According to Pick the elastic fibers have two main sources: from the elastic tissue in the serous coat and from the same in the coats of the blood-vessels. Pick draws attention to the arrangement of the elastic fibers as being highly significant. Its preponderance in the subserous and supravascular layers, their direction toward the endometrical cavity, and their close conjunction with the muscle fibers, show a definite purpose. They serve, not only as a support to blood and lymph vessels, but reinforce the muscular action of the uterus, protect it from being overstretched and make easier the return to a passive state after distention or contraction. The elastic fibers increase up to the fourth month of pregnancy, after this there is no apparent increase except in the paracervical tissue, where it plays an important part in labor. During the puerperium, when the other tissues of the uterus undergo involution, there is an actual increase in the amount of elastic tissue. There is also a marked tendency toward clumping of its fibers, which we will discuss later. After the menopause there is a diminution in the caliber of the vessels from a thickening of their walls and again a marked increase in the elastic tissue about these groups. In the external layers of the uterus — the serous and subserous — there is also a marked increase in the elastic tissue. Melnikow-Raswendenkow (quoted from Anspach) compares it to similar changes taking place in other organs, the kidney, liver, heart, spleen. It is believed to take the place of atrophied parenchyma, be it epithelial or muscular, and furthers the

mechanical internal equilibrium of the organ. It is the vis-a-tergo that prevents a disturbance of the dynamics of secretion. When the uterine fibers atrophy, it helps contract the vessels and takes the place of the lost parenchyma.

Dr. Anspach has kindly given me a number of drawings which illustrate very well the changes in the vessels during pregnancy. (Figs. 13, 14, 15, 16, 17, 18, 19, 20, 21, and 22. Note explanatory text under each drawing.)

Fig. 13.

Fig. 15.

Fig. 13. Transverse section through entire wall of multiparous uterus at the fundus. Hematoxylin Eosin. Stratum subserosum (S. S.). Stratum supravasculare (S. S. V.). Stratum vasculare (S. V.). Stratum submucosum (S. S. M.). Endometrium (E.). (Anspach.)

Fig. 15. Multiparous uterus. Area of the vascular layer, showing some of the smaller vessels. Weigert's. A., arteries. V., veins. L., lymph spaces. The increase in elastic tissue, the result of pregnancy, is at once seen when this picture is compared with Figure 14. Observe the tendency to clumping of the fibrils. (Anspach.)

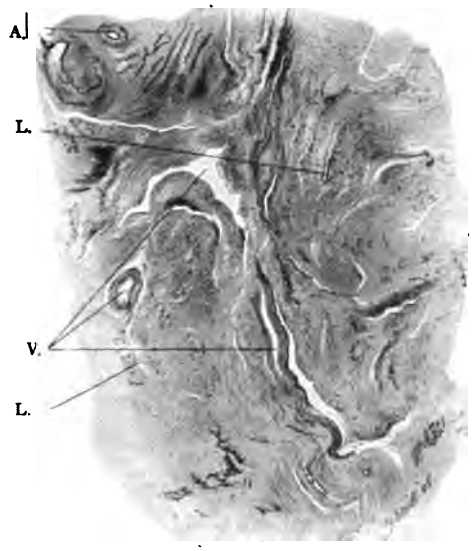

Fig. 14. Nulliparous uterus. Area of the vascular layer showing some of the smaller vessels. Weigert's A., arteries. V., veins. L., lymph spaces. There is little elastica in this layer except that of the vessel walls. In the arterioles a definite internal elastic membrane can be seen; the veins show an irregular arrangement of the elastica — most of it at the periphery of the vessel. The elastica of the lymph spaces is not well formed and consists of isolated fibrils. Note the fineness of the elastic fibers and the absence of clumping. The clefts in the tissue with no elastica about them are artefacts produced by shrinkage of the tissues during the hardening. (Anspach.)

By following the history of the uterine musculature thus we note that it is subject to great differences in structure at different periods of

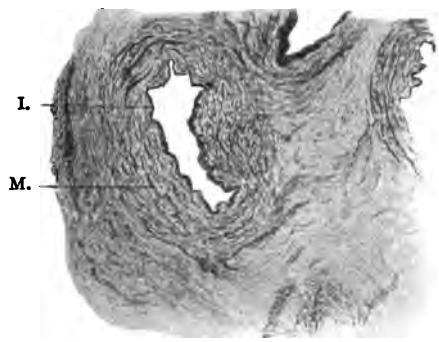

Fig. 16. A group of arteries from the vascular layer of a nulliparous uterus. Weigert's. Note the fine anastomosing smooth fibrils throughout the media (M.). The internal elastic membrane (I.) is well formed and regular. There is no breaking or clumping of the fibrils. (Anspach.)

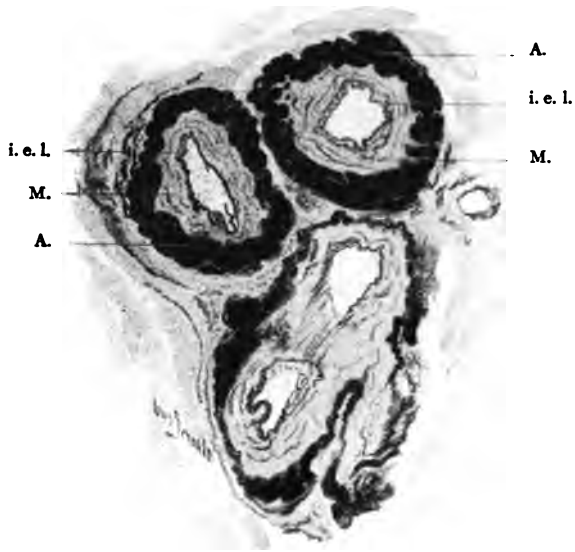

Fig. 17. Group of arteries from vascular layer of multiparous uterus. Weigert's. The internal elastic lamina (i. e. l.) appears well preserved; there is no tendency to clumping of the elastic fibers in the media (M.). The adventitia (A.) presents solid clumps of elastic tissue. *Periarterial degeneration.* Compare with Figures 16 and 18. (Anspach.)

life; up to the childbearing period such difference are largely those of development, after childbearing up to the menopause we note certain degenerative changes which may be

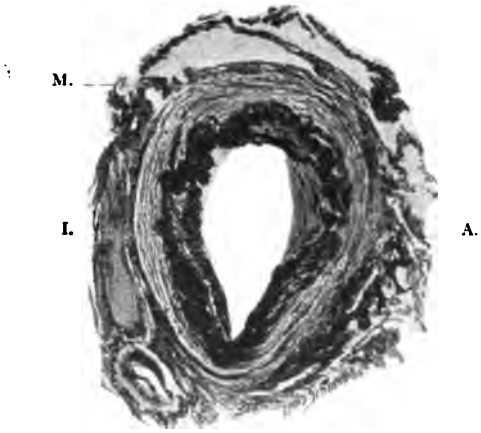

Fig. 18. Medium-sized artery from vascular layer of multiparous uterus. Weigert's. Note the increase of elastic tissue in the media (M.) and adventitia (A.). The internal elastic lamina (I.) is greatly thickened and the fibers are broken and gathered into clumps. *Intramural arterial degeneration.* Compare with Figure 16. (Anspach.)

Fig. 19. Same artery as in Figure 18. Van Gieson's. Observe the increase of fibrous tissue (red) in the media (M.) and its irregularity. *Intramural arterial degeneration.* (Anspach.)

roughly summed up in an appreciable degeneration of muscular elements, a slight increase of fibrous elements, degenerative changes in the vessels, and a marked increase in the elastica. The changes in the vessels are purely physiological, due to the lessened demands upon them following pregnancy. The elastica

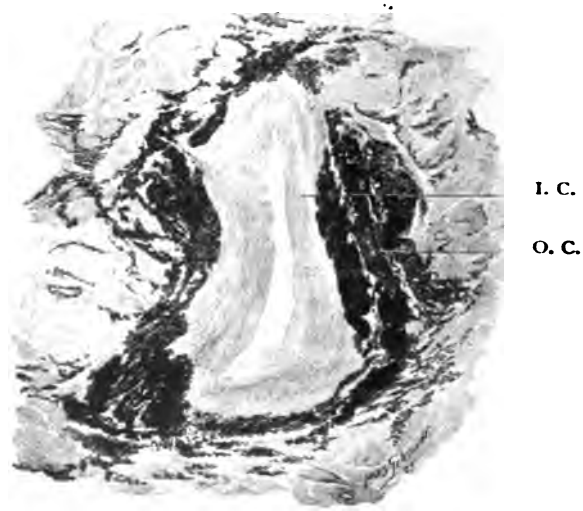

Fig. 20 Large vein from vascular layer multiparous uterus. Weigert's. The inner coat (I. C.) shows no change. The outer coat (O. C.) is represented by large deposits of elastic tissue in clumps. *Perivenous degeneration.* (Anspach.)

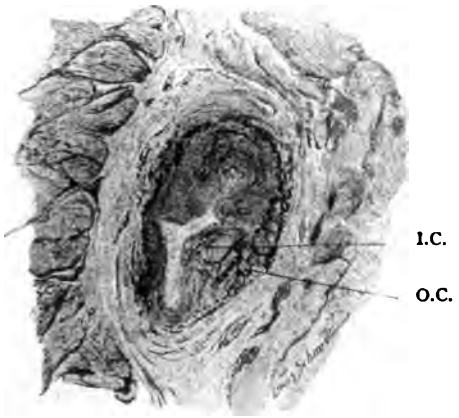

Fig. 21. Medium-sized vein from vascular layer of nulliparous uterus. Weigert's. Observe that the inner coat (I. C.) is spun through with fine elastic fibrils; the elastic tissue is especially condensed at the border between the inner coat (I. C.) and the outer coat (O. C.). It is all rather irregular but shows no tendency to clumping. (Anspach.)

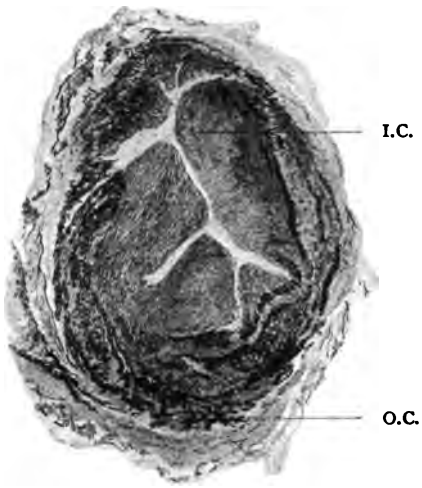

Fig. 22. Large vein from vascular layer in multiparous uterus. Weigert's. The inner coat (I. C.) is thickened and fine elastic tissue is seen throughout; between the inner coat (I. C.) and the outer coat (O.C.) the elastic tissue is considerably increased and shows considerable clumping. (Anspach.)

simply helps to maintain the organ in a state of mechanical equilibrium. In the subinvoluted uterus, however, we note that such changes are irregular.

Theilhaber and Meir, as well as others, have noticed the marked increase of fibrous elements in the subinvoluted uterus. This may best be seen by comparing gross sections stained with Van Gieson's or similar stains. It may also be noted and can be fairly well estimated by bisecting uteri removed by hysterectomy, and examining the cut surface.

The cause of the bleeding so commonly found with such uteri has been the chief subject of interest with most investigators. Theilhaber and Meir think it due to a muscular insufficiency due to the increase of fibrous elements at the expense of the muscular, of which I have spoken. Pick and Anspach are inclined to the view that a lack of proper increase of elastic tissue causes it, and Anspach cites three cases with uncontrollable bleeding in which such a condition was present. Reinche, Dunning, Findley, and others ascribe the bleeding to vascular changes.

Following somewhat the method of Anspach we have examined eight of our subinvoluted uteri removed by hysterectomy, staining them with Weigert's and Van Gieson's. For comparison, a considerable number of other uteri were stained in similar manner. This was done merely for the purpose of reviewing as far as possible, the results of others, more especially of Anspach and Theilhaber and Meir. By comparing the sections of subinvoluted uteri stained with Van Gieson's with those of the non-pregnant uterus, the increased amount of fibrous tissue was marked in all of our specimens. We could also note the clumping of the elastic tissue about the vessels in the multiparous uterus. Many of the cases associated with hemorrhage showed, apparently, a lesser amount of elastic tissue, but this did not hold good in all cases, so that we were unable to verify Anspach's suggestion that in this might lie the cause of hæmorrhage.

Associated with a subinvoluted uterus are certain other findings which are almost constant and which bear an intimate relation to the uterus itself. First of these to be noted is a thinning and lengthening of the uterine ligaments and supporting structures. Such a uterus, when not adherent, can be pushed in widely different directions. It is a factor in the common prolapse of such an organ or its tendency to sag downward. The tissues of the vagina are also usually relaxed. Secondly, there is a greater blood supply than we see

under normal circumstances, as may be seen by an examination of the broad ligaments and in operations upon the walls of the vagina. Thirdly, it is often associated with lacerations of the cervix and outlet.

Just why one uterus should involute normally and another not, is by no means clear. One has but to scan any of our modern textbooks on the subject, and note the long list of causes given, to be convinced that we know very little about it. We are apt to assume in this much more than we know. Some factors, however, we may suspect as having some bearing on the subject. Causes which lead to an increased blood supply to the pelvic organs may thus in some way interfere with proper involution. It might reasonably be presumed that lacerations of the cervix, for instance, in nature's attempt to heal the same, would bring more blood to the part and thus in some way prevent perfect involution. Retroversion and prolapse, through their commonly associated increased blood supply, may act in the same way.

Treatment. Involution should be practically complete at the end of six weeks from labor. A systematic examination of every woman at this time would undoubtedly lead to the correction of such pathological processes as are commonly associated with and may be the cause of subinvolution. If lacerations or displacements are found at this time, with a large uterus, their correction is more than ever indicated. It must always be borne in mind that the earlier the condition is attended to, the better is the chance of controlling it by minor procedures. Curettment is applicable to patients in whom the last labor has been comparatively recent — say two or three years. Gordon, as early as 1884, suggested taking a large V-shaped wedge from the uterus as in trachelorrhaphy. This is undoubtedly of much benefit where the trouble has not been of too long duration. An amputation of the cervix may be carried out when there is marked hypertrophy of this part and when future childbearing is not probable. All of these procedures are well known, are often carried out, and when rightly applied are effectual.

There remains, however, a class that I do not believe can be satisfactorily reached by any of these measures. I refer to the woman who is nearing the menopause, who has borne children for a number of years, and in whom symptoms have existed for a considerable length of time. Conservative measures, such as I have named, are peculiarly apt to fail, or to benefit but slightly. Hysterectomy — by which I mean either a supracervical amputation, or in case the cervix is much eroded and thickened, a complete hysterectomy — gives far better results. The preservation of the childbearing function, which in the younger woman is such a strong indication for the saving of these organs, ceases almost entirely at this time of life to be of any importance. Such patients are peculiarly easy to operate upon, since the uterus, through the relaxation of the ligaments, becomes easily accessible to operative measures and I believe that this operation does not offer any more danger than many of the so-called simpler operations when opening the abdomen is necessary.

I wish to briefly report twenty-three hysterectomies done for this indication. This did not include, of course, those in which other lesions were the primary factors, such as pelvic infections, neoplasms, or marked prolapse. It might be well to state, however, that my opinion has been largely influenced in this by the many satisfactory cures that one obtains where hysterectomy is demanded for such other lesions. Of the twenty-three patients mentioned, the youngest was thirty-five, the oldest fifty-five, and the average age forty-two. Nine of the twenty-three were losing so much blood at or between menstrual periods as to be serious. Five had profuse flowing, enough to warrant active interference; in nine the flow was practically normal, if present at all. They were suffering simply from the marked pelvic discomfort to which such patients are subject. In twelve of the patients the position of the uterus was practically normal, in six there was retroversion, in four there was some tendency to prolapse, in one there was a considerable amount of prolapse with retroversion, but the uterus was very large and this formed the chief indication for its removal. There was no mortality in this list nor unusual convalescence from operation. They have all been practically free from every symptom

referable to the pelvis and have been among the most appreciative patients with whom I have had to deal.

Against this operation may be argued its relative seriousness, the bringing on of an artificial menopause, and certain ideas of sentiment which the patient may have against the removal of her sexual organs.

On the other side may be placed complete cessation of pelvic symptoms, and to most of these patients this means far more than any of the above things I have stated.

It might be argued that these patients are near the menopause, and that when this takes place their symptoms will cease. It is just here that the climacteric is apt to be delayed and even then the symptoms do not always subside. I believe it much better to undergo such an operation than to wait perhaps five or even ten years, with the accompanying undermining of the woman's health and nervous system. I am convinced that we have been too conservative with such patients, and would urge hysterectomy being done more frequently than is now commonly practiced. On the other hand, no hysterectomy should be done without careful weighing of every point pro and con. The things that have the most weight in my mind are: the long continuance of the symptoms, severe loss of blood, the non-relief by simple procedures, the age of the patient, the size and condition of the uterus.

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MULTILOCULAR CYSTS OF THE JAWS[1]

By DEAN D. LEWIS, M. D., Chicago, Illinois

THE jaws are occasionally the seat of cystic growths, which cannot be classified as either periosteal or follicular cysts. Although these growths differ in histology, clinical course, and mode of growth they have many things in common, such as a central position in the jaw (they may, however, occur upon the free margin of the gums), and the tendency to benignancy, even though composed of misplaced epithelium. These tumors, which appear in the literature under a number of different terms such as "multilocular cystic tumors of the jaws," "kystes multiloculaires," "cystoma proliferum multiloculare" and "epithelioma seu adenoma adamantinum," are generally regarded as uncommon. Senn states that multilocular cysts of the jaws are rare; Steensland in 1901 could find in the literature but 21 cases which he was willing to accept as undoubted examples of tumors of this character.

Undoubtedly these tumors are more common than is generally supposed. There has been until recently, considerable discussion as to the origin and classification of these growths, which, however, present fairly typical histologic characteristics. Probably some of them have been classed with other tumors of the jaw, for even such an authority as Bland-Sutton states that a careful re-examination of a few of the specimens described as multilocular cystic epithelial tumors of the jaw and a study of the description of others, especially those arising in individuals past middle life, has satisfied him that many of them are endotheliomata.

Recently I have had the opportunity of examining three of these tumors which presented some interesting clinical features. One was removed by Dr. A. D. Bevan, one by Dr. S. C. Plummer and one by myself. The case histories and the anatomic peculiarities of these three tumors will be given before the clinical features of this group of tumors are discussed.

Case 1. Mr. G. S., aged 66, a janitor by occupation, was referred to me July 12, 1909, by Dr. E. C. Rosenow. He stated that five years ago he noted for the first time an enlargement of the right half of the mandible in the region of the molar teeth. The swelling, which gave rise to considerable pain, gradually increased in size. It was frequently incised or punctured to permit of the escape of material which the patient describes as pus. A year after the swelling appeared the patient consulted a surgeon who removed a piece of tissue for microscopic examination. The scar following the operation is still visible over the most prominent part of the growth. After examination of the tissue the surgeon deemed an operation inadvisable and suggested X-ray treatment. A large scar resulting from an X-ray burn can be seen over the center of the tumor. The tumor decreased somewhat in size after several exposures. The growth then gradually increased in size for three years, becoming as large as a good-sized fœtal head. For some time it has remained about the same size.

The patient now complains of a severe, almost constant pain in the part of the mandible affected. The right half of the body of the mandible and a part of the corresponding ramus is occupied by a tumor which is larger than a large fœtal head. It extends down to the hyoid bone in front, into the parotid compartment behind, to the middle of the ramus of the jaw above, and well into the mouth cavity internally. The mass projecting into the mouth extends backward to the anterior pillar of the fauces and displaces the tongue so much to the left that speech and mastication are interfered with.

Externally the tumor is covered by thin atrophic skin, which, however, moves freely over it. The skin is not even attached at the site of the scar which followed the incision for removal of tissue. The tumor is so large that it cannot be displaced upon the underlying tissues. The mucous membrane covering the growth is thickened and white. It moves freely over the tumor and is neither infiltrated nor ulcerated. About the center of the alveolar border is a sinus lined by granulation tissue through which a probe can be passed through the center of the growth down to the skin at the level of the hyoid bone. Every day the patient drains off about three ounces of fluid from one of the large cysts by passing a grooved director by the aid of a mirror into it. After the removal of this fluid he is generally relieved of his pain for the rest of the day. No sequestrum can be felt with a probe.

The growth is partially cystic, tense, fluctuating areas being separated by those of firmer consistency. Aspiration of the cysts reveals a sero-hæmorrhagic fluid, which contains streptococci. No parchment-

[1] Read before the Chicago Surgical Society, November 5, 1909. See Discussion, page 103.

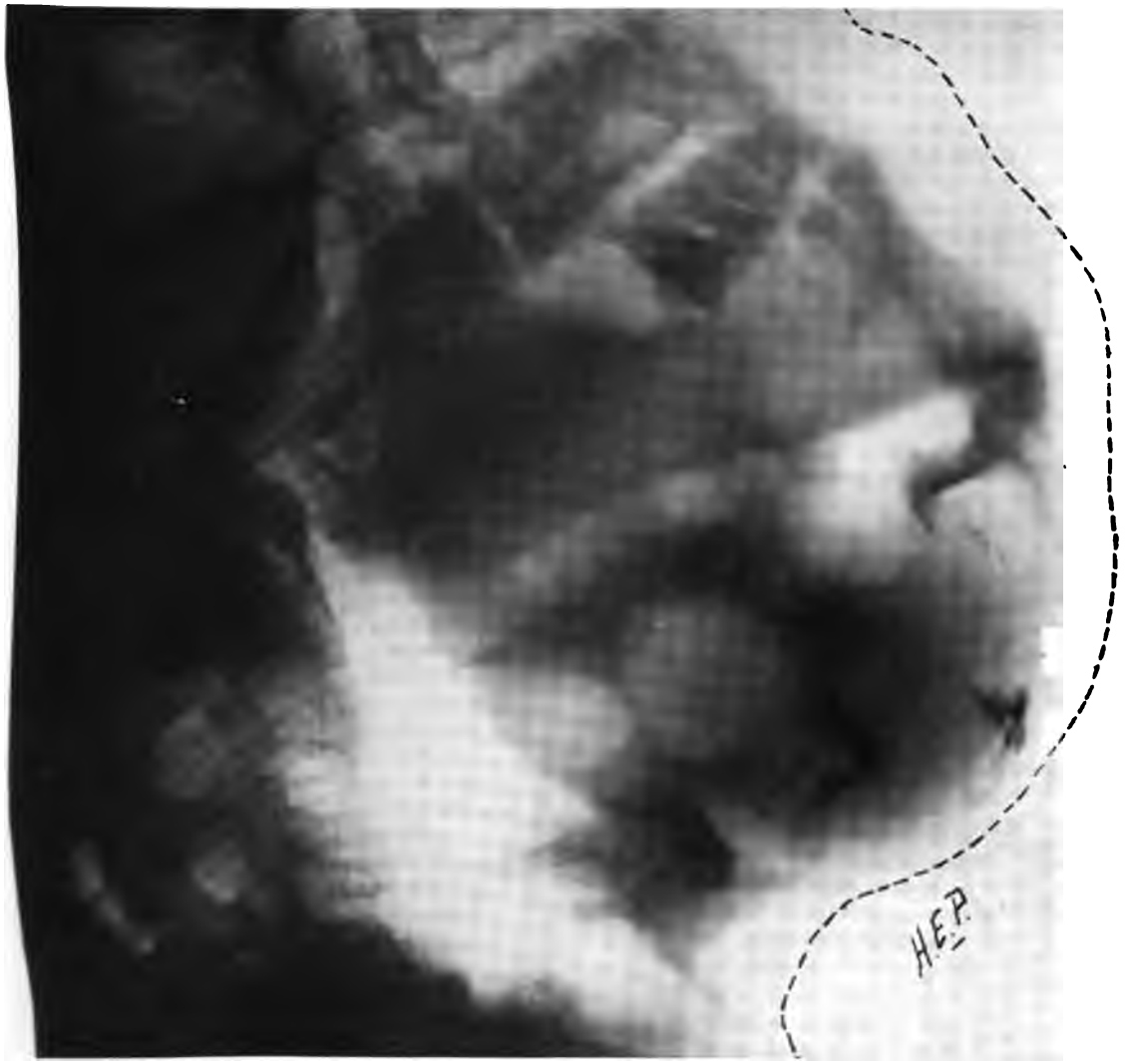

Fig. 1. X-ray picture of cyst described in Case 1. The multilocular nature of the growth is shown, the different cavities being separated by heavy trabeculae, some of which contain bone. The extension of the growth into the mouth is also shown. The dotted line represents the outline of the soft tissues of the face and neck.

like crackling can be elicited. There is no enlargement of any of the regional lymph nodes.

The X-ray picture (Fig. 1) reveals several large cystic cavities and indicates clearly the cystic nature of the tumor. A diagnosis of multilocular cyst was made upon the clinical history and the physical characteristics of the growth.

The tumor was removed July 17, 1909. I was assisted by Dr. C. J. Rowan. The incision extended through the middle of the lip downward and backward to the hyoid bone and then upward and backward to the mastoid process. The tumor was so large that the jaw could not be held forward and respiration was considerably embarrassed. The cysts were therefore immediately aspirated, eight ounces of fluid being removed. The growth then partially collapsed and it could be manipulated easily. Respiration then became free. A typical resection of the jaw was then performed, after ligation of the external carotid artery which controlled bleeding very successfully. The jaw was divided at the middle of the ramus. Two small cysts remained and their lining membrane was curetted away.

The patient withstood the operation well. He developed pneumonia on the third day, but recovered slowly; convalescence being rather prolonged.

Fig. 2. Hemisection of tumor represented in Figure 1. The growth could not be manipulated because of its size before the cysts were aspirated. Several large cysts — some of which contain old blood clots — may be seen in the lower part of the figure. The white part of the tumor adjacent to the alveolar process is composed almost entirely of solid columns of enamel epithelium. One-half size.

GROSS APPEARANCE OF TUMOR

The tumor even after the removal of 8 ounces of fluid is as large as a big orange. It is made up of a large number of cysts varying in size from a lentil to a walnut. These are lined by a granular membrane which in some cysts is reddish in color, in others grayish. Some of the cysts contain old blood clots, but there is no history of any rapid increase in the size of the tumor such as might follow a hæmorrhage into one of these cysts. Interspersed throughout the tumor are solid, white masses of tissue such as may be seen in Fig. 2 near the alveolar border. These are composed almost entirely of epithelial cords. Transitional stages from solid tumor masses to small cysts and from small cysts to larger ones are abundant in different sections of the growth. There is very little bone in the tumor. Most of the septa are entirely fibrous, here and there a plate of bone being found.

Microscopic examination. The lining of the large cysts is composed of a rather firm, connective tissue stroma supporting an epithelial membrane, which resembles somewhat the mucous membrane of the gums in its early stages of development. This resembles closely adamantine epithelium. Scattered throughout the stroma are groups of cylindrical cells irregularly arranged, and cylindrical cells surrounding a lumen, reproducing histologically a gland tubule.

A section from the white masses adjacent to the alveolar border reveals a bizarre histologic picture. The stroma, which is not very abundant, supports a large number of narrow and broad cell columns, some of which are solid, some of which contain a lumen. These cell columns may be simple or branched, branching columns often ending with bulbous projections. The epithelial columns are supported by fibrous tissue which sends out process to join the adjacent cell columns. These columns are naturally cut in all possible directions. All the columns have an external layer of cylindrical cells. The nucleus is placed near the central end of the cell, the basal part forming a protoplasmic seam, the cells resembling closely those of the enamel organ in a six or seven months' old fœtus. The inner part of the cell column is made up of a number of cells, which have a net-like arrangement. The cells adjacent to the cylindrical epithelium are polygonal in shape, while those occupying the center, but also scattered among the polygonal cells, are stellate in form. The cytoplasm of the stellate cells stains with eosin and small colloid droplets are seen within it. Degenerative changes are evidently taking place within these cells, cyst formation being the result. Transitional stages can be traced from groups of cylindrical epithelium to branched columns, composed of cylindrical, polygonal and stellate cells, to small cysts and from small to larger ones. The diagnosis of multilocular cyst could be easily made upon the gross appearance of this tumor. The histologic picture is typical, the epithelial groups and columns reproducing the enamel organ in different stages of its development.

CASE 2. Mrs. M. A., aged 56, was admitted to Dr. Bevan's service at the Presbyterian Hospital July 21, '05. She stated that the present trouble began 14 years ago. She then complained of toothache, which would recur periodically, especially when she became chilled. The toothache gradually increased in severity and as some of the teeth on the affected side were carious they were extracted. At this time no swelling was noticed. Gradually the face became swollen, but no expansion of the alveolar process of the right maxillæ could be made out by intraoral palpation.

Fig. 3. Patient 18 days after removal of tumor shown in Figure 1. No prosthesis. There is considerable deviation of the left half of the mandible to the right.

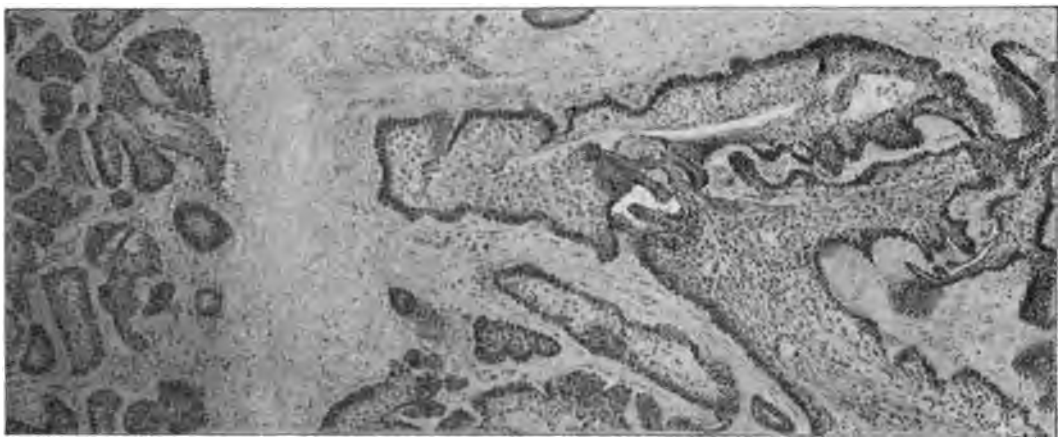

Fig. 4. Section of cyst removed by Dr. Bevan. Small, round cell columns, cut transversely, are seen in the left of the figure. The large branching cell columns in the right of the figure are composed externally of cylindrical cells, while the cells forming the inner part of the columns are polygonal and stellate in form. These cells have their prototypes in the cells of the tunica interna, stratum intermedium, and zona media of the germinal enamel epithelium.

In 1898, seven years after the first symptoms, an intraoral operation was performed by a dental surgeon and a mass, together with the surrounding bone, was removed from the posterior part of the right upper maxilla. After two years the tumor, accompanied by severe pain, recurred. Another, but more extensive operation was then performed and a diagnosis of dentigerous cyst was made.

The patient remained well for 3½ years when the tumor again recurred. Physical examination at this time reveals a mass the size of a hen's egg which extends downward from the gum of the right maxilla posteriorly. This mass has the consistency of cartilage and is covered by a thick, white, mucous membrane which is not ulcerated. It is apparently encapsulated and when palpated a "parchment-like" crackling can be elicited. The teeth are wanting on the affected side. There are no enlarged lymph nodes. An examination of the antrum of Highmore was not made.

July 24, '05, an intraoral enucleation of the tumor was performed, the enucleation being carried wide of the capsule.

The antrum of Highmore was opened during the operation, as the mass extended well up into the cavity. The antrum was packed with iodoform gauze. The patient recovered rapidly from the operation and there has been no evidence of any return of the growth four years after the operation.

Macroscopic examination. The tumor, as large as a hen's egg, is composed of a number of small cysts which contain a mucoid material. The cysts vary in size from that of a pea to that of a hickory nut. They are separated by fibrous septa, but little bone or cartilage being found in the growth.

Microscopic examination. The stroma of this cyst is composed of dense fibrous tissue containing relatively numerous blood-vessels. No bone or cartilage is found in the sections examined. Solid columns of cells, which may be round, elliptical, or irregular, are found throughout this stroma. In the lower part of Fig. 4 may be seen several round columns which are cut transversely, while in the upper part of the figure, irregular columns with many outgrowths with bulbous endings may be seen. In the round and oval columns two types of cells may be seen. The cells upon the outer part are cylindrical, possessing a large nucleus which stains heavily with hæmatoxylin. The cells occupying the center of these columns are polygonal in shape, have a small nucleus, and considerable cytoplasm. A third type of cell, stellate in form, is found in the irregular columns shown in the upper part of Fig. 4. These stellate cells in some areas contain colloid droplets and are apparently undergoing degenerative processes to form the mucoid content of these growths. The cylindrical cells are very suggestive of enamel epithelium. The three different types of cells occurring within this tumor have their prototypes in the epithelium of the embryonal enamel organ, the cylindrical epithelium forming the tunica interna, the polygonal cells, the stratum intermedium, and the stellate cells, the zona media of this structure. The transitional stages from solid cell columns to small cysts and from small to larger cysts may be easily followed in different sections of this growth. The histology is typical of tumors of this character in advanced stages of development.

CASE 3. I am indebted to Dr. S. C. Plummer for the opportunity of publishing this case, the following history of which he has kindly prepared for me. This history was taken at Wesley Hospital, Chicago, October 1, 1908.

Miss F. T., aged 14 years, was born in Chicago of Swedish parents. She is a school-girl and weighs 85 pounds. Father died of pulmonary tuberculosis 5 years ago. Mother died of same disease seven years ago. Family history otherwise negative.

Fig. 5. Section of cyst removed by Dr. S. C. Plummer. The character and arrangement of the epithelium differs somewhat from that represented in Figure 4. It is apparently of an earlier embryonal period. This probably accounts for the rapid growth and recurrence of this tumor.

When 9 or 10 years of age, she went to a dentist to have two of her temporary teeth pulled, because they were being pushed out by the permanent ones. She has had no illnesses except measles.

In March, 1908 (seven months ago), she first noted a small white spot on the mucous membrane of the upper jaw over the site of the left canine tooth. There was no pain or other subjective symptom. This spot has gradually increased in size until at the present time it is as large as a hickory nut. The growth resembles in appearance granulation tissue. Occasionally the gums bleed moderately. The patient's general health is good.

On September 20, 1908, a portion of the growth bordering on the normal surrounding tissue was removed for microscopical examination. The laboratory report stated that the portion removed consisted of granulation tissue. On October 2, 1908, at Wesley Hospital the growth, together with two teeth and a portion of the alveolar process, was removed The wound healed promptly and the patient left the Hospital October 11th.

The laboratory report upon the tissue removed at this time was that of a spindle-cell sarcoma.

The patient reported to Dr. Plummer at intervals of about one month, and until six months after the operation the result appeared to be perfect. At this time a small cyst appeared at the site of the operation. This contained a clear fluid, resembling honey, and had all the clinical characteristics of a mucous cyst. It did not resemble in the least the primary growth. The cyst was opened and cauterized with silver nitrate. Other cysts of a similar nature appeared from time to time, and these were treated in the same way. After a few weeks a growth 1 cm. in diameter had formed, which resembled in every way the growth removed three months before.

A more extensive operation was then recommended but the patient's friends sent her to a practitioner who had a reputation for curing cancer by medicine. She was not seen again until early in September, 1909, at which time a large tumor was found, which caused the left malar region to bulge prominently and forced the upper lip so far forward that the mouth could not be completely closed.The tumor extended so far to the right that it involved the two incisor teeth upon that side. The surface of the tumor had the same appearance as when seen almost a year before.

On September 10, 1909, at St. Luke's Hospital, an excision of the left upper maxilla was performed. The patient was given ether. First, the left external carotid artery was ligated near its origin, and the incision closed and covered with collodion.

A laryngotomy was then performed and the ether was administered through this opening with a Trendelenburg apparatus. The pharynx was packed with gauze and a typical excision of the maxilla was performed. Portions of the right palatal process and septum were also excised.

The tumor completely filled the antrum of Highmore, its upper surface being unattached and rounded. The anterior wall of the antrum and the alveolar and palatal processes as well were involved in the growth and had undergone partial pressure atrophy. The free portion of the tumor had the appearance of a myxoma. The patient's recovery from the operation was uneventful.

Microscopical examination. This tumor differs somewhat histologically from the preceding. The stroma has much the same appearance but the arrangement of the epithelium differs somewhat. The same cylindrical epithelium is found, but it is somewhat more irregularly disposed. In some areas groups of this epithelium are found. Immediately adjacent to these groups, the epithelium may have a circular arrangement, enclosing a granular debris. This apparently indicates the beginning of cyst formation. Some of the tubules are regular in outline, while others are very irregular. They all represent the beginning of cyst formation. The small ones appear quite like those described in the clinical history as appearing

upon the mucous membrane of the gum and resembling mucous cysts.

The diagnosis of cystic adamantinoma could be easily made upon the characteristics of the epithelium, but the arrangement of the latter is not nearly as typical as that of the two growths described above. The polygonal and stellate cells are few in number. It is difficult to determine positively which of the three tumors is the most advanced, but I am inclined to believe that the last represents the enamel epithelium in the earliest stages of its development. This is also indicated by the more rapid growth of the tumor, which attained considerable size in one year and eight months. This growth is rapid for an adamantine epithelioma and indicates, possibly, that the enamel epithelium found in this tumor approaches more nearly the embryonal type than that of the two preceding, which had a comparatively slow growth.

These three cysts, although they differ considerably in structure, belong to the same group, the cylindrical epithelium being their most characteristic feature, the polygonal and stellate epithelium aiding, however, in their classification. One is reminded in examining these growths of different stages in the development of the enamel organ. Falkson, as early as 1879, suggested that these growths developed from cells entering into the formation of the enamel organ. This theory was later demonstrated to be correct by Malassez, who found that only a few of the epithelial buds developing from the invagination of the gingival mucous membrane were used in the formation of the enamel of the temporary and permanent teeth. Groups of enamel epithelium are normally found in embryonal and adult jaws which are irregularly distributed from the roots of the teeth to the under surface of the gum. These masses of epithelium probably correspond to the enamel anlagen found in animals which regenerate a number of different sets of teeth. Malassez gave the name of débris épithéliaux paradentaires to this paradental epithelium from which these tumors, reproducing in their growth different stages of the enamel organ, develop.

Several other theories, which have neither an anatomic or pathologic basis, have been advanced to explain the origin of these growths. Büchtemann suggested that these tumors developed from ingrowths of gingival epithelium into sinuses or along the roots of carious teeth. His suggestion was accepted by Eve and Trzebicky. It is difficult, however, to see how such complicated growths as these could develop from ingrowths of ordinary buccal mucous membrane, the ordinary squamous cell carcinoma being much more apt to form on such a base.

Diday, Nélaton, and Guibout believed that these growths developed from the simple follicular cysts, but as Malassez states this theory may account for the origin of some cysts with few cavities, but does not explain the development of growths, whose cavities exceed greatly in number those of the parent cyst. In this connection may be mentioned the occurrence of unilocular cysts with a lining of adamantine epithelium. Bloodgood found that a majority of the dentigerous cysts examined by him had no epithelial lining. Two of his cases, however, had a lining of adamantine epithelium, the contents resembling those of an atheroma. Bland-Sutton states that some observers have noted the presence of an epithelial lining in follicular odontomata, but that in two recent specimens examined by him no epithelial lining was found. Barry and Preindlsberger and Wodcynski have also described unilocular and paucilocular cysts with a lining of adamantine epithelium. I believe that these cysts should be classed with follicular cysts even though they have a lining of adamantine epithelium, because cystic growths resulting from the degeneration of cells occurring in the center of epithelial columns are undoubtedly multilocular from the very beginning.

These tumors are much more common in the lower than in the upper jaw, the former being involved eleven times more frequently than the latter. This is quite remarkable when it is remembered that periosteal or periodontal cysts are much more common in the maxilla than mandible. Becker, in 1894, could not find a single case of multilocular cysts of the upper jaw. A number of cases are now recorded, two of the cysts forming the basis of this paper having occurred in the maxilla. As mentioned by Becker, early invasion of the antrum of Highmore by cysts occurring in the maxilla may have led to errors in diagnosis and the failure to recognize the true nature of the lesion.

The posterior parts of the jaws are much

more commonly involved than the anterior. In some cases, however, tumors which have reached an enormous size have taken their origin near the incisor teeth. The paradental epithelial debris is probably quite as abundant about the front teeth as the back, but the hyperæmia associated with inflammatory process, which are so common about the molar teeth, may be the exciting factor in the development of these growths and account for their more common occurrence posteriorly. Teeth are occasionally found in the cysts (Perthes, Wilks, Bernays). These teeth may be remnants of a tooth follicle surrounded by the proliferating enamel epithelium or, if rudimentary, they may be formed by the proliferating enamel epithelium, for Ollier observed a tumor of this character in a boy of fifteen in which small rudimentary teeth resembling those of a rat had developed in scar following a previous operation.

Although these tumors may occur at any age they are most common at or past mid-life, which clinical fact is used by Bland-Sutton as an argument against their origin from epithelial vestiges of the enamel origin for as he says they should then be more common in early life than they are. The average age of the 70 cases reported in the literature is 33. It is difficult, however, to determine the exact time at which the growth began to develop in some cases for frequently an indefinite history extending over periods of ten, twelve, and fifteen years can be elicited. Massin has observed a congenital tumor of this class, while Coote has observed one in a child of six months of age and one in a man of 75. While these tumors may occur at any age they are more apt to develop in mid-life as previously stated, and this may help in differentiating between them and follicular cysts, which, with the exception of those developing about the wisdom teeth, usually develop at an earlier period.

It is often difficult to recognize these tumors early in their clinical course for they have no distinctive features which enable one to differentiate them from a number of growths which are common within the jaw. In advanced cases a mistake in diagnosis could scarcely be made for the clinical history and the physical characteristics would enable one to exclude almost any other lesion. A multilocular cyst may exist for a number of years without affecting the general health of the patient. Cases have been reported in which the tumor has existed 26 and 29 years without giving rise to any distressing symptoms, the patient seeking surgical aid because of the size of the tumor or for cosmetic reasons. In seventy cases the average time between the beginning symptoms and the removal of the growth has been eight and one-half years. While such a growth may enlarge quite rapidly in the early part of its development it may later become stationary and remain so, as in the patient described under case 1.

The mucous membrane covering these growths is usually perfectly smooth and not ulcerated. Of course, there are numerous exceptions, but whenever the mucous membrane is ulcerated, it is due to inflammatory changes in the cysts, infection occurring accidentally through adjacent teeth or following aspiration or incision of the cavities. The lymphatics are not involved even when these growths have existed for long periods. No other growth occurring within the jaw can reach such a size as these without being associated with ulceration of the mucous membrane, involvement of the lymphatics or infiltration of surrounding tissue. The cystic nature of the growths can easily be determined by palpation of the large cysts. Often "parchment-like" crackling is an important diagnostic sign. When these tumors appear upon the gums, especially if solid, it may be impossible to differentiate them from epulides. If the tumor has developed rapidly, as is apt to be the cases in young patients (cf. case 3), it may be impossible to make a positive diagnosis before an exploratory incision is made. Small solid adamantinomas, precursors of multilocular cysts, may be mistaken for osteomas, and cystic growths for simple cysts of the jaw, or if it is not known that the growth has existed for some time for soft, central sarcomas. An X-ray picture should be an important diagnostic aid in these cases, as it should reveal the multilocular nature of the tumor early in its course. The smaller cysts are not, however, always shown, for in Fig. 1, an X-ray picture of the tumor described under case 1, but few of

the many cysts of which the tumor is composed are shown. A single unilocular cyst is usually a follicular cyst, and multiple cavities are indicative of an adamantinoma. An X-ray picture should enable one to differentiate between multilocular cysts and sarcomas. In a number of cases, however, it is practically impossible to make a positive diagnosis until a cyst is incised and the character of its wall observed. The reddish gray or gray granular membrane of multilocular cysts, often studded with small papillary outgrowths, can hardly be mistaken for any other anatomic structure occurring within the jaw.

It is quite possible that mistakes in microscopic diagnosis might be made notwithstanding that the histology of the growths is quite typical. If the interlacing, narrow, and wide columns of epithelial cells are abundant, the tumor might be mistaken for a carcinoma, but the character of the epithelium should prevent such a mistake. If the stroma is very cellular, a diagnosis of a sarcoma might be made, if an area in which no epithelial columns were present were examined.

As would be expected from the clinical course of these growths, which is essentially benign, the prognosis following operative procedures is good. Recurrences are common, but even in cases in which the tumor has recurred two or three times, the recurrences are usually local and there is no involvement of regional lymph nodes. The recurring growth, as a rule, reproduces the histology of the primary tumor. They show no more tendency to malignancy when they recur than do febromas which have been but partially removed. Heath has reported an interesting case in which, after repeated recurrences and extirpations, a round cell sarcoma developed from the stroma of the cyst resulting in multiple metastases and death. Bloodgood has reported twelve cases of growths of this character. One was considered to be inoperable. In eleven cases the diseased area was resected. Nine of the eleven patients have remained well from one to twelve years, one had a local recurrence but has remained well eight years after the second operation. One died of lung complications which followed removal of the growth. Isolated cases are reported in the literature in which tumors of this type have formed metastases but some doubt exists in nearly all cases as to the exact nature of the growth. Hutchinson, for example, reports metastatic growths in the lymph nodes adjacent to the adrenal glands in a case of tumor of the jaw, which is supposed to have been an adamantinoma; the patient dying eight days after operation of bronchopneumonia. This case, cannot, however, be accepted without reserve, for the tumor had pursued an exceptionally rapid course, attaining considerable size in three months.

The resection in all cases should be carried wide of the growth. It is practically impossible to enucleate these cysts as small cysts or solid enamel epithelium, which will later form cysts, will be overlooked. Curettage of the lining membrane offers no guarantee of permanent cures. When the tumor invades the antrum of Highmore it may be possible to resect the alveolar border of the maxilla surrounding the downward projection of the growth and after opening the antrum to enucleate the mass. This procedure was successfully employed in the case operated upon by Dr. Bevan.

The inefficacy of conservative methods is demonstrated by the number of recurrences which have followed enucleation, curettage, and destruction of the cyst by the actual cautery and caustics. Partial resection may be attempted if the cyst is small. Letenneur's experience, however, indicates that epithelial rests may remain even after fairly extensive resection. In performing a resection he left the lower border of the mandible to act as a bridge between the resected ends. Eight years after a cyst formed in this bridge. An attempt was made to destroy the growth with an actual cautery, but the growth soon returned.

If the bone has been destroyed by the growth or if the tumor has reached a large size, a typical resection will be necessary. Multilocular cysts of the jaw rarely become inoperable because of their size, because in most instances the growth can be considerably reduced in size by aspiration of the fluid contents.

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THE DIAGNOSTIC VALUE OF DISTENTION OF THE RENAL PELVIS, THROUGH THE URETERAL CATHETER[1]

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ANYTHING which lessens the difficulties of abdominal diagnosis is of importance, and especially is this true of the right lower quadrant, where the confusion of affections of the kidney with those of the appendix, gall-bladder, and uterine appendages may lead to serious errors in the placing of incisions and the relief of symptoms. I have met with many instances in which the removal of the appendix was performed or contemplated when the trouble really lay in the kidney (usually an intermittent hydronephrosis, tuberculosis, or even a stone), and sometimes operations are done upon the kidney when the appendix is at fault. The same proposition is true of the gall-bladder, the tube, the ovary, and certain less common pathologic conditions in the right or left side of the abdomen. This confusion, I am convinced, is more common than is generally appreciated especially in chronic cases without the presence of fever. This is readily understood when one remembers that the pain and even the tenderness of kidney affections is often felt at McBurney's point or under the ribs near the gall-bladder; while the urine may be almost or entirely negative. Perhaps the greatest difficulty lies with intermittent hydronephrosis, the attacks of which come at intervals, like the exacerbations of chronic appendicitis or gall-bladder trouble, when the kidney is not sufficiently enlarged to permit of its palpation. These attacks are due to occasional obstruction to proper drainage, from kinking of the ureter, or other causes. Recent observations have shown this obscure disease to be much more common than was formerly supposed, at the same time emphasizing the difficulties en-

[1] Presented at the Colorado State Medical Society, September 16, 1909.

countered in its diagnosis. There can be no doubt that it has been the cause of many operative errors, one of which, I am sorry to say, lies at my own door. This was a case which came to me some years ago, from a neighboring State, with a history of repeated attacks of what appeared to be appendicitis, the diagnosis having been positively made by the local physician and confirmed by one of the best diagnosticians in Colorado. In these attacks there had always been pain, tenderness and rigidity in the right iliac fossa, with nausea and vomiting and some rise in temperature, and but little if any disturbance in the region of the kidney itself. When I saw him, between the attacks, the urine was practically normal and there were no renal symptoms; so the appendix was removed without hesitation, a moderate abnormality being considered evidence that it was the cause of all the trouble. After the patient returned home, however, the attacks continued exactly as before (is there a surgeon who has not had this embarrassing experience?) and it finally became necessary to remove a hydronephrotic kidney that had meantime become infected and filled with multiple abscesses.

Fortunately a method has lately been suggested by which such mistakes can be avoided in obscure cases. This consists in passing an ureteral catheter up to the kidney by means of a cystoscope and dilating the renal pelvis with a solution of salt or boric acid. If the pelvis contains much more than it normally should, a corresponding degree of hydronephrosis must be present; and in addition, as soon as the pelvis is completely filled, pain is produced, which serves to locate the seat of the trouble, in that it does or does not correspond to that from which the patient has previously suffered. For instance, a woman was referred to me not long since with a movable right kidney producing, supposedly, much disturbance in the right side which incapacitated her for her various duties. There seemed to be little if any question regarding the diagnosis; but, largely for the sake of mere experience, I dilated the renal pelvis with a solution of boric acid. When the distention became great enough to produce pain, to my surprise this was totally different from that usually experienced by the patient, her habitual pain being lower down, in the region of the appendix. I hence concluded that the trouble was not in the kidney, but in the appendix, this view being confirmed by subsequent operation.

In another case, a woman complained of a very annoying intermittent pain in the left iliac region, extending up into the back towards the kidney. A renal difficulty being suspected, the ureter was catheterized and the pelvis of the kidney distended with normal salt-solution. The pain produced was entirely different from her usual discomfort and was located in the back over the kidney itself. This resulted in a pelvic operation with the removal of a diseased tube and an ultimate cure.

It is very satisfactory to note the promptness and accuracy with which patients locate the pain produced by a distended renal pelvis. There is no doubt about it and no suggestions have to be made. They often say "There, that is just like my old pain;" or "That hurts me, but it is not like I have always felt before." Sometimes the discomfort is considerable, but it soon wears away, as the kidney empties itself, and no harm results.

As with other means of diagnosis, excessively nervous or hysterical individuals may be difficult to deal with, and it is possible that erroneous conclusions might be reached; but this does not occur often and affects the general usefulness of the procedure but little. With children many difficulties exist, relating to the use of the cystoscope, the impossibility of controlling the patients, and the unreliability of their statements.

In further illustration, I was not long ago consulted by a woman who had been excessively annoyed for a long time with pain rather low down in the right side of the abdomen, combined with irritation of the neck of the bladder. Examination of the urine, an X-ray picture of the kidney, and a skin-test for tuberculosis revealed nothing of importance. She had been in the hands of several excellent physicians who had variously diagnosed ovarian trouble, a tubal lesion, and appendicitis, while one had frankly confessed himself completely at sea. Fortunately it occurred to me to dilate the renal pelvis, which contained vastly more

than normal, and immediately all the symptoms were reproduced, just as they had always presented themselves, thus demonstrating the presence of intermittent hydronephrosis, relief being obtained by subsequent operation.

There is some difference of opinion as to the normal capacity of the renal pelvis, but it can be said with certainty that when it contains over 50 cc. hydronephrosis exists, this being usually accepted as the proper standard. Kelly and others, however, affirm that anything over 7 to 10 cc. indicates a pathologic condition, and the writer has found, in numerous instances, that pain is produced in the normal kidney by the insertion of this amount of fluid. For obvious reasons, however, it is best to accept this latter diction with caution for the present, at least.

The technique of the procedure is simple enough, if one has had some practice with the cystoscope, and is devoid of danger, providing the ordinary rules of asepsis are observed. The end of the catheter must be inserted completely into the renal pelvis and not simply into the ureter. The solution must be warm and should be slowly injected so as not to cause renal colic prematurely. If the fluid is strongly tinged with methylin-blue, the mouth of the ureter may be obscured through the cystoscope during the process of injection so as to make sure that too much of the solution does not escape around the catheter, which, however, is seldom the case.

In injecting the solution, a syringe may be used with a metal plunger, to facilitate sterilization, and with a small pointed tip that will fit accurately into the ureteral catheter. It should be of considerable capacity and graduated in cubic centimeters.

I have employed this valuable aid to diagnosis in numerous cases with the greatest satisfaction, and I am sure it has assisted me in avoiding incorrect conclusions on several occasions. I desire to add my testimony to the proposition that, if it were more often employed in obscure abdominal and renal cases numerous mistakes would surely be avoided.

PREMATURE MENOPAUSE[1]

A Study of Cases from Dr. L. J. Ladinski's Clinic at Beth Israel Hospital

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MENOPAUSE is a term which is commonly given to a collection of phenomena appearing in connection with the cessation of menstruation, and comprehends the whole process of senile involution of the generative organs. These phenomena manifest themselves over a period varying from 1 to 5 to even 10 years, after which there is usually a period of steady decline. Anatomically, the generative organs — internal and external — and the breasts are the first seat of the involution processes, and later the whole body takes part in it. These anatomical changes have been classified by Currier as follows:

1. Changes, the result of menopause.
2. Changes, the cause of menopause.
3. Changes, coincident with menopause.

All authors are agreed that the first changes noted as the result of menopause appear in the ovaries. Here there is a slow atrophy — the epithelial elements giving way to connective tissue growth — resulting in death of the graafian follicles, loss of nerve, artery, and lymph supply, with the production of scars in the tunica. Progressive with these, there is noticed in the uterus, at first congestion and hyperplasia, followed by atrophy, the uterine atrophy appearing later than the ovarian. The Fallopian tubes shrink and become shorter,

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the fimbriæ gradually disappear, the vault of the vagina contracts, the vagina becomes shorter, the introitus undergoes narrowing and the character of the glandular secretions becomes changed, their quantity also diminishing; the pubic hairs become straighter, the labia minora contract and sometimes disappear; the mammary glands begin to shrink, frequently only after a preliminary fatty enlargement.

In a remarkable series of autopsies on females of all ages, performed by Dalton while engaged in an extensive study of the corpus luteum, the different changes in the uterus and ovaries, described above, were actually noticed.

The anatomical changes which produce menopause are mostly to be found in the ovaries. Börmer, commenting on the relationship between early development of menopause and well marked atrophy of the uterus, states that to attempt to establish such a relationship on a scientific basis seems unwarranted. He regards atrophy of the uterus as a sequel. On the other hand, degeneration of the parenchyma of the ovary, by benign or malignant neoplasm, plays an important rôle in the production of early menopause.

It is not the object of this paper to deal with any of the pathological features preceding, attending, or following the menopause, but rather to call attention to a condition which occurs in otherwise healthy subjects when menstruation ceases for good at or before the age of 30. Only such cases are included, where the periods, which hitherto recurred in a normal or abnormal manner, cease permanently, without being affected by external or internal influences, and without the occurrence of any previous or subsequent disturbances of the economy, or without the objective demonstration of any disease. The series herein recorded presented themselves in patients who in every way seemed to be perfectly well; in fact, at the time of first observation, they were invariably in better physical condition than before, most of them having become more robust than when menstruation existed. In this respect, they are not unlike other women, who having arrived at a normal menopause, show a tendency to become obese.

As to the usual age at which menopause is arrived at, statistics are plentiful. Tilt estimates it occurs normally between 40 and 60.

He reports one case that menstruated irregularly up to the age of 61, and cites another where the function persisted up to 70 years, after a cessation of 12 months. Currier cites 10 other cases between 60 and 93. Robinson reported one case in which menstruation ceased at 50 only to reappear one year later and continue up to the 70th year. The one case of a nun, who at 100 began to menstruate regularly for three years thereafter, is a case frequently cited from the "Saxonia" as illustrative of the latest menstruation. Scanzoni, however, is of the opinion that any menstruation after 53 should be looked upon as pathological.

The following table collected by Krieger gives at a glance the averages estimated by various authors from a large number of cases.

Mayer,	in 13,471 cases, average age was 50
Tilt,	in 9,780 cases, average age was 50
Guy,	in 11,250 cases, average age was 45
De Boismont,	in 9,944 cases, average age was 40
Courty,	in 14,045 cases, average age was 45
Puech,	in 11,594 cases, average age was 50

Estimating further from their statistics it was noticed that

(a) ½ of all the cases occurred between 45–50
(b) ¼ of all the cases occurred between 40–45
(c) ⅛ of all the cases occurred between 35–40
(d) ⅛ of all the cases occurred between 50–55

thus bringing the largest number of cases between the 45th and 50th years, the second largest between 40 and 45. Such voluminous statistics are convincing. In the literature, a number of cases of late menstruation are cited, but as these are unusually rare and foreign to the subject matter of this paper, they are not noted in detail. Battey, Piron, and Kisch each reports one or more cases. It is certainly a matter of much doubt if any of these cases is really a true case of late or protracted menstruation; Scanzoni, who collected much material, has probably said the last word on this subject when he stated that any menses after 53 was due to some pathological lesion. This statement offers an excellent working rule in gynecological practice.

Interesting also in the whole matter of menstruation in its many phases, is the question of its period of occurrence or duration. Most authors agree that the earlier it begins the longer it is likely to continue. The average duration estimated by Tilt is 32 years. The

following interesting table, compiled by Hanover from a total of 277 cases is cited by Tilt:

No. Cases	Beginning	Cessation	Years
5	12	47.80	35.80
18	13	45.89	32.89
15	14	44.98	30.98
34	15	45.56	30.56
38	16	45.13	29.13
36	17	43	26
49	18	44.96	26.96
33	19	44.79	25.79
28	20	45.36	25.36
10	21	44.10	23.10
4	22	43.50	21.50
3	23	44.33	21.33
4	24	39.50	15.15

Menstruation that ceases before the age of 40 is irregular, still many indeed are the instances where it does so cease, the patients continuing in good and excellent health thereafter. For the purposes of classification, a menopause occurring between the ages of 30 and 40 is considered early, that after 40 as normal and that before 30 as premature. Of the latter I have collected 11 cases from the clinical material in Doctor Ladinski's service at the Beth Israel Hospital Dispensary, appearing in the years 1907 and 1908. I have been able to collect 48 cases from the literature on this subject. Of these 48, Ed. Krieger cites the following 35:

De Boismont 2, Courty 1	at 21	3
Mayer 2	" 22	2
Krieger 1	" 23	1
Boismont 1	" 24	1
Mayer 2	" 25	2
Boismont 1	" 26	1
Tilt, Guy, Boismont, 1 each	" 27	3
Guy, Boismont, Courty, 1 each	" 28	3
Mayer, Boismont, Courty, 1 each	" 29	3
Mayer, 5, Tilt, 10, Guy 1	" 30	16
		35

To which I have collected and added:

Mundé, Montgomery, 1 each, Stark 2	at 26	4
Walter, Stark, 1 each	" 23	2
Felty, Napier, Stark, 1 each	" 30	3
Schalit, Stark, 1 each	" 21	2
Frazer, Stark, 1 each	" 19	2
Kisch, 1 case	" 17	1
Kisch, Dalton, Stark, 1 each	" 20	3
Napier, 1 case	" 29	1
Foster, Currier, Stark, 1 each	" 28	3
Stark, 1 case	" 18	1
Stark, 1 case	" 22	1
Stark, 1 case	" 24	1
		24

On rearranging both these lists, and taking in all the cases collected, we have as follows:

Menopause at	Cases
17 Kisch	1
18 Stark	1
19 Frazer, Stark, 1 each	2
20 Dalton, Kisch, Stark, 1 each	3
21 Schalit 1, Boismont 2, Courty 1, Stark 1	5
22 Mayer 2, Stark 1	3
23 Krieger, Walter, Stark, 1 each	3
24 Boismont, Stark, 1 each	2
25 Mayer	2
26 Montgomery 1, Mundé 1, Boismont 1, Stark 2	5
27 Tilt, Guy, Boismont, 1 each	3
28 Foster, Currier, Guy, Boismont, Stark, Courty 1 each	6
29 Mayer, Boismont, Courty, Napier, 1 each	4
30 Mayer 5, Tilt 10, Guy 1, Felty 1, Napier 1, Stark 1	19
	59

Wherever recorded in these cases, the examination of the genitals reveals conditions not dissimilar to those appearing at normal menopause. Whether or not these latter conditions are the result or the cause of menopause is not at all clear, unless we accept the findings of Dalton. His investigations, previously referred to, point out the progressive changes in the uterus and appendages, before, during, and after "change of life" and in various conditions of bodily disease. The case of the prostitute (cited in the list above) who ceased to menstruate at 20, showed atrophy of uterus and ovaries. Such atrophy is undoubtedly the rule in most of the cases of prematurity — it proved to be so in all of our own reports. Dalton, in his pathological series, has brought out the fact that the first signs of atrophy began in the ovaries, and became quite marked before the uterus would begin to diminish in size. This fact seems to lead to the inevitable conclusion, that the different forms of atrophy of the uterus, in their relations to accompanying amenorrhœa or menopause, are dependent for their primary cause on preceding changes in the ovaries. In this light, the uterine atrophy is a secondary change, and not a cause, and thus, the uterus comes to be regarded as the retrograde metamorphosis of a gland which has become functionally useless.

The changes, therefore, in the ovarian parenchyma are important factors in the ques-

tion under consideration. It has been observed for instance, that in acute febrile diseases and in the exanthemata, the parenchyma of the ovaries suffered sympathetic changes, and in the severe onsets these same primary changes in the ovaries resulted in a cessation of menstruation. Courty (quoted by Walter) cites three cases when menopause ensued after cholera.

That hyperplasia resulting from frequently succeeding pregnancies should result in early menopause is evident, when we consider the inevitable retrogressive changes following such hyperplasia; namely, cirrhosis. Such is the case reported by Mayer, where there were six full term pregnancies in rapid succession, menopause ensuing at age of 29. Here too, the defective innervation due to the anæmia of numerous pregnancies stands in causative relation.

Such agencies as peritonitis, acting from without, as well as the excessive involution seen in lactation, are given as etiological factors. Munde's case, menses ceasing at 26, is cited as applicable to this latter cause. Walter thought that the atrophy of the ovary was due to atrophy inhibition or disease of a local menstrual ganglion and nerve plexus, rather than disease in the organ itself.

That psychical influences should have a permanent damaging effect on the menstruating mechanism is indeed a remarkable feature. Still the fact that such is the case seems to be positively established in a few of the cases collected. Incidents, subjecting the patients to sudden fright, or affliction, or severe pain, do very frequently interfere with the normal phases of the menstrual cycle, is so far as to retard its progression or modify temporarily the intervals between cycles. They also permanently interrupt the function. Walter's case, reported 19 years after its occurrence, was in an unmarried individual of 23, who, after hearing the shocking news of her mother's sudden death, ceased to menstruate. The two cases of Tilt, both due to sudden frights, are further illustrative of this causative factor. Though shock and fright are not considered as resting on a scientific basis, many authors, including Schröeder, Stephenson, and Kisch, have included these agencies in their summaries of all causes.

Where advanced tuberculosis and diabetes show predilection for the generative organs, or following severe dysentery, the whole organism is so undermined that it is not at all surprising that the function of menstruation, so often looked upon as the expression of good health, should be wholly or temporarily suspended. But in the cases cited above, there is no co-existing disease or defective generative organs, and menstruation does cease, the patients continuing in good health and even becoming pregnant. Mayer's case No. 3, and our own case No. 8, illustrate this. This continuance of ovarian function, independent of menstruation or prolonged after its cessation will be referred to again in a succeeding paragraph.

Börner and others give heredity as an occasional cause of prematurity. In Schalit's case, reported to substantiate this fact, the patient ceased menses at 21, after having had two living births — her mother ceased at the age of 33.

Obesity was thought by Kisch to be the cause and not the result of early cessation. Currier, who has given this subject much attention, states it as a rule to be a constant one, that a woman under 30 who becomes obese, usually suffers from amenorrhœa or oligo-dysmenorrhœa (where otherwise menstruation was not painful) and in addition, is usually sterile. It is a noted fact that a great many women begin to take on fat at or after the menopause, in other words, at a period coincident with sterility. This fact is a feature in many of the cases cited in this paper. This tendency seems to have been the rule in nearly all of our cases and in most of those where the matter of the physical condition was mentioned by other writers, these patients proffering the statement that since menopause began, they have become stouter and even obese, and furthermore, that they never felt better.

Sterility and amenorrhœa, and especially in the menopause, are matters concerning which the patients with early cessation are most likely to seek advice. Though menopause is usually looked upon and really is the termination of the childbearing period, literature abounds in numerous instances in which preg-

nancy occurred after complete cessation, and this too, not only in the early cases, but also in the typical ones; namely, those occurring after the forty-fifth year. Illustrative of this latter class are two cases reported by Currier, those of Puech, Kisch, and Krieger. Piron tells of a woman who aborted a two months' fœtus at the age of 72. Mayer reports a case where menopause intervened at the age of 22, and a child was born three years after. Walter reports a case of absence of menstruation for three years after a normal labor and then a pregnancy after one reappearance of the function. Evidently ovulation bears no relation to menstruation, else we could not account for pregnancy occurring during lactation, in girls who have not yet menstruated, and in the Esquimaux, who have amenorrhœa during the winter months (case 8 of our series, had a child 3 years after cessation). In Tilt's series of 49 cases of menopause between the ages of 29 and 39, there was an average of 3 children in 26 married women; of the eight married ones in our series, 4 bore children.

The incidence of 11 cases, out of a total of 3,301 who presented themselves at our clinic in the years 1907 and 1908, would indicate a frequency of 1 in 300, by no means an insignificant percentage. The causes for early menopause, cited by other authors; namely, fright, oöphoritis, tuberculosis, and diabetes, cholera, severe anæmia, and hyperinvolution processes following super-lactation and rapidly recurring pregnancies, do not figure in any of our cases. These latter seem to be from the outset types of irregular and scanty menstruation, in which the ovarian function has worn itself out, so to speak, without impairing the health of the patient. Whether due to a defective development in the generative organs cannot be positively gainsaid; yet it is difficult to look upon any of these cases in any light other than they present unnatural conditions due to disorder, defect, or disease of some kind. It is true, however, that absence of previous or subsequent local or constitutional diseases is the rule in a great many instances (cases of Napier, Tilt, Mayer, Montgomery, Walter, and our own). The following are brief histories of the list of cases:

Foster. Sudden cessation at 28 in a previously healthy individual, after "taking cold"; subsequent health did not seem to be so good; developed Addison's disease 10 years later.

Dalton. Prostitute, died at 21 of cardiac disease; menses ceased at 20: ovaries described as very small.

Currier. Cessation at 30, ascribed to involution atrophy, due to rapidly succeeding pregnancies, seven in number.

Montgomery. Menses began at 14, regular but scanty and gradually getting less, finally ceasing at 26; married at 23, when she weighed 98 pounds; reported at 27 when she weighed 170.

Bloom, in a series of 400 cases, gives the earliest menopause as having occurred at 29; no history of case.

Börner. Menstruation began at 16; at 26, after a normal labor, menses reappeared eight weeks later, but stopped on third day; no show for four years (time of report of case; no subsequent report).

Mayer's cases. 1. Menses at 14, ceased at 25; married at 27. Sterile. Examined when 39; uterus small.

2. Menses at 13, married at 16 and had six children and one miscarriage; menses ceased at 29 without cause. Patient began to get stouter and never felt better.

3. Menses at 13. Had 5 children between 17 and 28; had not menstruated since age of 22. Examined when 33.

4. Menses began at 14, married at 20, child at 21; no menses after 22d year; observed for 10 years.

5. Menses at 13; married at 20; in fourth year of wedlock had two children; menses ceasing after second birth; supposedly after "severe fright." The patient became idiotic and epileptic, though previously healthy.

De Boismont's cases. 1. Menses at 16; two children; profuse hæmorrhage at 27; no reappearance; partial paralysis following.

2. Menses at 10½; cessation at 28; well when seen at 46.

3. Menses at 16; regular up to 21; four children before this; 9 days after last confinement, husband died suddenly; lochia ceased; no return of menses when seen at 37.

4. Menses at 13; married shortly thereafter; four children, last one at 21. After fright, menses suddenly ceased; jaundice for few months thereafter; not at all well subsequently.

Courty's three cases ceased at 30, following severe cholera. Two were reported well after 10 years, the third after 15 years.

Krieger. Menses at 13; regular but scanty; had retroflexion. Menses once in 21st year; thrice in 22d year, and cessation at 23. Uterus described as atrophic.

Tilt reports 10 cases with menopause at 30 and one at 27. Details of only three of these are given:

1. Ceased at 30; still nursing a baby of 16 months. Husband dropped dead in her sight; "stunned by blow."

2. Regular menses up to 30; threw a dead rat out of window, thinking it a coal; no menses for four years.

3. Sudden disappearance at 30 after a fit; no menses when investigated 12 years later.

Guy in a series of 300 cases, reports 3 cases, occurring at 27, 28, and 30 respectively; but gives no history. He says, however, that he has included no case due to severe disease.

Mundé reported one case following excessive involution after confinement, at age of 26; no subsequent history.

Walter. Menses at 11; unmarried; owing to severe shock, menses ceased at 23; remained well thereafter; reported when patient was 43.

Felty. Cessation at 30; no history details.

Schalit. Ceased at 21, after two living successive births; menses at 14; reported when patient was 33; uterus described as small. (Had severe hæmorrhage during second pregnancy and at parturition, but remained well after menopause.) (Mother of this patient ceased menstruating at 33.)

Frazer. Menses at 15; married at 18; ceased at 19; sterile; only one menstruation after marriage.

Kisch has two cases. 1. Menses at 9; married at 15½; fat and growing fatter (obesity here given as the cause of menopause). At 17 noticed diminution and then cessation. Sterile.

2. Menses at 13; married at 16; ceased at 20; sterile.

Napier. 1. Menses at 14; married at 26 and had a child, which was not nursed; after this menses became scanty and gradually diminished, finally ceasing at 30.

2. Ceased at 29; virgin; regular until 16; irregular and scanty between 16 and 28; ceased at 29; became stouter.

Our own cases, which follow, are selected from all those who applied at the clinic during 1907 and 1908 and include only those either observed two years or more, or those in whom the menopause was absent for a period longer than four years before seeking advice. Among these new cases (numbering in all 3301) there was a number in whom menstruation had ceased and in whom the characteristic atrophied uterus was present, but the period of observation was considered too short to include these cases in the present report.

In none of our cases are any of the causes present for early cessation such as figure in other cases; rather is the cause unassignable. In other words, ours are simply pure cases, *per se*, of premature menopause.

Case 2. No. 2, 653. B. L., age 28; married 6 mos.; menses regular until two years ago.

Case 3. No. 1. C. W., age 38; menses at 14; irregular and scanty until 23; menses not seen again until 29 (which was one year after marriage) and continued regulary for one year; not seen since that time.

Case 4. No. 29. B. F., age 30; menses at 13; married 6 years; 3 children; youngest 4 years old. Menses ceased 10 months ago, reappeared 6 months ago and continued monthly for 3 periods, then ceased entirely (i.e., 2½ years ago), uterus atrophic.

Case 5. No. 311. S. C., age 19; menses at 15, continuing for 6 months, when it ceased entirely; breasts well developed; uterus atrophied.

Case 6. No. —. R. M., age 28; menses at 13; then absent for one year; irregular on its return; married at 23; appeared twice at 6 months' intervals since then; one child 12 years ago.

Case 7. No. 109. R. B., age 32; menses at 13; regular until 20; married at 24; no menses in 12 years, is now 190 pounds and getting stouter.

Case 8. No. 167. M. D., age 27; began at 17; regular until 4 years ago; not since then; married 5 years; one child a year ago; growing stouter.

Case 9. No. 466. D. D., age 29; menses at 13; regular up to 3 years ago, when last child was born; not since then; married 13 years; 2 children.

Case 10. No. 550. Y. C., age 23; menses began at 13; regular up to 2½ years ago; not since; feels perfectly well; getting stouter.

Case 11. No. 2,035. R. F., age 23; menses at 14; regular until 5 years ago; then at irregular intervals until 3 years ago, when it was absent for 1½ years; then reappeared for 3 months and is now absent for 15 mos.; taking on flesh past 4 years, always was thin.

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CHANGES IN THE NORMAL ENDOMETRIUM DURING MENSTRUAL LIFE, BASED UPON THE STUDY OF ONE HUNDRED CASES

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IN our preparation of this work, we have reviewed the histories and examined the curettings of the patients operated on in the gynecological clinic of the University Hospital during the last ten years, accepting only those in which no lesion, such as fibromyoma, cysts, or inflammation was present, and in which a history of regular menstruation was given. Our study has been based upon the excellent work of Adler and Hitschmann (Monat. f. Geburt. und Gyn., bd. xxvii, h. 1), who have so clearly shown that the normal endometrium passes through a definite cyclic transformation, the complete cycle embracing the time from one menstrual period to the next; furthermore each cycle is divided into four periods; viz., post-menstrual, interval, premenstrual, and menstrual.

A hard and fast rule in the separation of these four periods cannot be established, since in the various transformations there is a gradual change observed in different portions of the endometrium and even in different areas of the same section. In our description, therefore, we will detail those findings which predominate in the period under consideration, and which may be looked upon as more or less characteristic.

We will begin with the changes observed during the post-menstrual period, since the picture presented is the simplest of the four, and gives a starting point from which the further developments may more easily be traced and better understood.

Post-menstrual period. The endometrium is thin and pale with a smooth surface. There may be scattered here and there a few subepithelial ecchymoses as evidence of the preceding menstruation, but they are never extensive.

Even the first day after menstruation has ceased, the surface is found to be covered with a continuous layer of low, narrow, cylindrical epithelium. The glandular epithelium exhibits the same characteristics. The cell outlines are distinct. Their arrangement is symmetrical and the inner contour is sharply defined and smooth. The protoplasm is relatively small in amount and takes a homogeneous pink stain. The nucleus is deeply stained, occupies a large portion of the cell, and is oval or round, although the long oval shape, extending in the longitudinal axis of the cell, predominates. The nucleus occupies either a median or basal position in the cell. In both the glandular and surface epithelium, mitotic figures are seen, the number varying greatly in different specimens.

Immediately after menstruation, the glands are widely separated, straight, running perpendicular to the surface, and extremely narrow. In some glands the inner edges of the opposing cells seem to touch one another, as the result of which the lumen is practically obliterated. Later during this period, the glands become larger and their lumina are distinctly wider. The epithelial cells are somewhat higher than those observed immediately after menstruation, and continue to present sharp outlines and a smooth inner contour. The lumina of the glands are universally empty.

The stroma is composed of spindle-shaped and oval cells, the former predominating in some sections, the latter. in others. In the superficial portion of the mucosa, the cells appear to be arranged more loosely, exhibiting clefts between the individual cells, while in the deeper layers the cells are in more intimate contact, giving this portion a compact

appearance. The nuclei take the stain deeply and fill up the entire cell, although occasionally, a narrow ring of protoplasm can be distinguished. In several sections, small round cells with deeply staining nuclei are seen, occurring either scattered among the other cellular elements, or arranged in clusters. The stroma cells, as well as the epithelium, exhibit mitotic figures. Here and there may be seen the remains of hæmorrhage which has taken place during the menstruation, but these disappear a few days after the bleeding has ceased.

The interval. Toward the end of this period, the endometrium is thicker, pale, and the surface may be slightly wavy. Microscopical examination shows that the surface has lost its smooth outline, and is now thrown into small elevations. The surface as well as the glandular epithelium has become higher and broader. The nucleus is oval, extending in the long axis of the cell, is central or basal in its position, and takes a deep stain. The protoplasm stains a faint homogeneous red and is increased in amount. The cell outlines are distinct and sharp in contour. Later, as this period merges into the premenstrual, other alterations in the cells are observed. They become still higher and broader, and the inner cell contour loses, to a certain extent, its sharp outline, assuming a fringed appearance with less distinct differentiation between the individual cells. In some areas, the protoplasm maintains its homogeneous appearance, while in others it presents an inner zone which is finely granular, and an outer zone, which is homogeneous and faintly stained. The nuclei in these cells appear larger, are less deeply stained, and tend to assume the basal position. Mitosis is seen during the greater portion of this stage, which can be said to continue until ten or eleven days prior to menstruation.

The glands have now begun to take on a spiral course, and as the stage advances, this becomes more marked. Their lumina are distinctly wider and in most cases empty. In certain glands, however, the low power reveals what appears to be a red homogeneous content, which upon higher magnification is seen to consist of interlacing, closely arranged, red threads. That portion of the gland situated near the muscle does not participate in these changes.

The superficial layer of the stroma is seen to be composed of cells even more loosely arranged than in the preceding stages and consists largely of round and oval cells, while in the deeper layers the spindle-shaped elements are more abundant. There has been an increase in the amount of protoplasm and the nucleus maintains its staining properties. As in the post-menstrual stage, small mononuclear cells are found throughout the stroma, though more numerous near the surface. During the latter part of the period, superficial œdema frequently takes place.

Premenstrual period. The mucosa is greatly thickened and in certain areas may present papiliary excrescences. Six to eight days prior to menstruation, it is pale and œdematous, often gelatinous in character, but shortly before menstruation it appears somewhat congested. According to Adler and Hitschmann, the changes begin in the fundus and extend to the internal os where they are sharply circumscribed.

Microscopically the surface is very irregular, exhibiting decided elevations and depressions. The surface epithelium has become low and broad with a round, lightly stained nucleus which lies at the base of the cell, the protoplasm of which is lightly stained or transparent. Associated with these changes in the surface epithelium are seen even more marked changes in the glandular epithelium. During the first few days of this period, the epithelium becomes much higher and broader, due to an increase in the amount of protoplasm. During the early premenstrual period, the cells are arranged in one layer, while later many areas are found where the cells are irregularly stratified, appearing as if they were crowding one another for space upon the underlying basement membrane. This is especially marked at the summit of the papillary projections so frequently seen during this stage. The individual cells are not distinctly differentiated from one another, but it can be seen that their shape has become altered. The apex is wider than the base, giving a wedge-shaped appearance. The apices of the cells, in some areas, are rounded, so that the inner cell contour has lost its straight, sharp outline

and appears scalloped. In other areas, the surface of the cell projecting into the lumen appears to have been ruptured by some intracellular pressure, since fine finger-like protoplasmic projections are found, and even small pieces of protoplasm can occasionally be seen broken off from the cell. The protoplasm presents different pictures in different portions of the section. In some areas, it has an external homogeneous appearance, while the inner portion is finely granular, these granules staining a faint red. In other cells the protoplasm is homogeneous throughout, being faintly red tinged, while in still others, it appears an indistinct blue rather than red. If one compares the protoplasm of this stage with that of the preceding stages it is immediately seen that throughout the whole section, the protoplasm has lost to a great extent, its staining property. Decided changes have also occurred in the nuclei. They have assumed a round form and lie immediately upon the base of the cell. They largely maintain their coloring property, but shortly before and at the beginning of the bleeding, the stain appears lighter. As a result of the increased breadth of the cell, the nuclei are more or less widely separated from one another.

It is during this stage that the glands show characteristic changes in form. These alterations are more marked in the deeper portions of the endometrium, so that a division into a superficial compact and a deeper spongy layer can be identified. As the stage advances the glands become more tortuous, finally presenting deep multiple invaginations, often arranged somewhat regularly, giving a pleated appearance. The fundi of the glands lying in the deepest portions, i. e., next to the muscle, do not show these changes. The lumina of the glands, instead of being empty, may be seen to contain the thready, red substance already referred to in the description of the interval glands; while in others the contents consist of mucus, with a large amount of cellular debris. In sections obtained one or two days prior to menstruation, the mucus is especially abundant. In one of our sections in which mucus was present in a large number of glands, these glands have lost their irregular outline to some extent and have become more saccular. The protoplasm is stained a faint homogeneous blue, and the nuclei are oval rather than round and are more central in position.

In examining the stroma, it appears pale and œdematous, becoming more markedly so as the time of actual menstruation approaches. With high magnification it is seen that the stroma cells have greatly increased in size, due largely to the increase in protoplasm. Their shape has entirely changed, for instead of being spindle or oval, they are now polyhedral, due to the pressure they are exerting upon one another. When little or no œdema is present, the cells lie closely together while of course in the presence of much œdema, they are widely separated. The protoplasm is very lightly stained and at times appears transparent from its complete lack of stain. The nuclei have enlarged and are round or oval. In general, there has been a decrease in their staining property, but here and there cells are seen whose nuclei are deep blue. In other words the stroma during this stage resembles very strongly the picture presented by young decidua. The blood vessels are dilated and engorged with blood.

Menstrual period. Unfortunately no curettings taken during menstruation were at our disposal hence we will quote freely from the description of Hitschmann and Adler. The changes demonstrate a transition from the picture of the premenstrual to that of the postmenstrual period. After bleeding has commenced the thickness of the endometrium is greatly lessened. Microscopical examination shows that there is no longer a separation into a compact and spongy layer. The superficial epithelium may remain more or less intact showing only small clefts through which the blood has escaped. As a result of the bleeding into the substance of the endometrium, the blood may collect immediately beneath the epithelium, causing the well known subepithelial hæmatoma of Gebhard. Again there may be an extensive loss of the surface epithelium, so that even with the naked eye this can be recognized by its raw appearance; or a large portion of the compact layer may be cast off.

The changes in the glands are progressive, occurring from day to day. During the first day of menstruation they have lost to some

extent the tortuous course seen during the premenstrual stage and have become narrower — for it is during menstruation that the mucus content is thrown off. On the second or third day one sees the dilated glands still containing mucus alongside of straight, narrow, empty glands, until on the last day, the post-menstrual type predominates. These changes do not take place simultaneously over the whole endometrium, since in some areas there will be a preponderance of the dilated glands, in others of the narrow glands.

The character of the epithelium depends upon the form of gland examined. In the dilated glands the cells preserve the characteristics of the previous stage, while in the narrow glands the cells have become low, narrow, and poor in protoplasm. There is a loss in glandular as well as surface epithelium as shown by the presence of cellular debris in the glandular lumina. As a result of bleeding, the stroma of the endometrium is filled with red blood corpuscles and leucocytes. The stroma cells are separated and on account of the large amount of blood their contour is obscured.

Changes in the endometrium as the result of pregnancy. On the occurrence of pregnancy, the entire endometrium is stimulated and becomes thickened. This thickened membrane is known as the decidua. The formation of the decidua occurs very early in pregnancy. The exact date of its formation is in doubt, but in all the cases of very early pregnancy which have been reported, a more or less well developed decidua has been found. Thus a decidua was present in Peter's (Ueber die Einbettung des menschlichen Eies., Wein., 1899), and Leopold's (Uterus u. Kind., Leipzig, 1897), cases which were four and eight days' pregnancies respectively. The decidual formation is found only above the internal os, although a few exceptions to this may be met as in cases reported by Von Weiss (Cent. f. Gyn., 1897, 641) and Von Franque (Cervix und Unteres Unterinsegment, Stuttgart, 1897) in which isolated decidual cells were found in the mucosa of the cervical canal. These are rare cases and it may be positively stated that true decidual transformation takes place only above the internal os.

For purposes of study the decidua has been divided into three parts; namely, the decidua vera, which is that part of the mucosa lining the uterine cavity, the decidua basilaris or, as it is often called, the decidua serotina, which lies immediately beneath the ovum and is penetrated by fœtal elements (chorionic villi), and the decidua reflexa which, as its name indicates, forms the maternal covering of the ovum. His (Arch. f. anat. u. Physiol., Anat. Abth., 1897, 399), uses the terms decidua capsularis and basalis instead of decidua reflexa and serotina. According to Williams (Obstetrics, 109), the reflexa can be easily distinguished by the end of the first week of pregnancy and at the end of two or three weeks is a well defined membrane. As would be expected, during the early months of pregnancy the decidua reflexa does not entirely fill the uterine cavity. At about the fourth month, however, the ovum has grown to such an extent that the reflexa and vera have been brought in contact and the uterine cavity is entirely occupied by the ovum. At about this time a fusion takes place between the reflexa and the vera, after which the reflexa undergoes degenerative changes. Macroscopically the decidua reflexa is yellowish white in color and often shows small ecchymotic areas over its surface. The surface has a somewhat roughened appearance, and if examined with a magnifying glass, numerous small pits which correspond to the gland openings can be seen. As has been said, the decidua vera is a very early product of pregnancy. Due to the stimulation of pregnancy the mucosa of the body of the uterus begins to thicken so that at the end of the first month, the decidua may be .5 or even 1.5 cm. in thickness. The smooth velvety appearance of the surface of the non-pregnant mucosa is soon lost. The surface early becomes indented by numerous crypts some of which penetrate one-fourth to one-third the entire thickness of the mucosa. The gland openings which cannot be distinguished in the non-gravid uterus, can now be recognized with the naked eye as small depressions. The entire membrane has a mamelonated, cribriform appearance. At this stage it is sometimes spoken of as the lamina cribrosa.

In 1870, Friedlander (Physiol. anat. Untersuchungen uber den Uterus, Leipzig, 1870)

demonstrated that the decidua was composed of two distinct layers which could be recognized macroscopically. These consist of an upper compact or cellular layer and a deep spongy or glandular layer. The spongy layer is much the thicker. At about the third or fourth month, the decidua has attained its greatest thickness, after which period, as a result of gradually increasing intrauterine pressure, the membrane becomes thinner so that at term it measures but 2–4 mm. in depth and macroscopically the two layers can no longer be distinguished.

The macroscopical appearance of the decidua, characteristic as it may be, unless accompanied by some positively recognized fœtal element, is insufficient evidence upon which to warrant an absolute diagnosis of pregnancy. The histological recognition of the decidua is, according to the writers, sufficient grounds upon which to make a diagnosis of pregnancy. In arriving at such a diagnosis one must consider the picture as a whole, and not single elements such as a group of typical decidual cells or a typical gland. Furthermore, one must remember that the picture presented in certain specimens of endometrium taken during the premenstrual period, simulates the decidua of pregnancy very closely — in fact it may be impossible to differentiate the two when there is an early pregnancy. This is easy to comprehend, since the changes brought about by pregnancy are but a further step in the premenstrual stage.

The decidua varies at different periods of its development, histologically as well as macroscopically. For purposes of histological description and study it is easier to take up the individual elements of the decidua rather than describe a particular microscopic field.

The surface epithelium. The surface cells of the normal non-gravid endometrium are made up of ciliated cylindrical epithelium. These, as a result of pregnancy, become broader and more cuboidal, the nuclei stain less deeply. As pregnancy advances, and the intra-uterine pressure becomes greater, the surface epithelium becomes even more flattened and at term is represented by a single layer of endothelial-like cells. Klein (Zeitsch. f. Geb. u. Gyn., xxii, 247, 1891) was the first to call attention to these changes in the surface epithelium. He considered them characteristic of pregnancy. They are, however, of little importance unless associated with additional alterations of the endometrium, as similar changes are noted in conditions other than pregnancy.

The uterine glands. In the upper or compact layer of the decidua, the glands appear few in number. They are straight, narrow and compressed. As the pregnancy advances, the glands in the compact layer seem to decrease in number. In the deeper or spongy layer the glands compose almost the entire field. These glands are known as Opitz-Gebhard glands. They are large, dilated, tortuous glands, somewhat irregular in size and on cross section, as pointed out by Abel (Gyn. Path., Abel-Bandler, p. 79) are often triangular in shape. This triangular formation of the glands is present only in the compact layer. Later, as pregnancy advances and the decidua becomes thinner, the characteristic shape of the Opitz glands disappears and at the ninth or tenth month they are seen in the deeper layers of the mucosa as flattened, compressed tubules usually found running parallel to the long axis of the uterus.

The glandular epithelium, during the early months of pregnancy is of special interest. That found in the compact layer of the decidua is similar to the surface epithelium. As the dilated portion of the gland is approached, the character of its epithelium changes. It becomes somewhat higher, although still cuboidal. It is often proliferated, forming fern, ledge, or papilla-like projections into the lumen. At these points, the epithelium is variable in size and shape, being round, oval, or cuboidal, and it gives the impression of being loosely attached. The cells appear to partially overlie one another. The cell outlines are distinct, the cytoplasm finely granular, the nuclei oval or round, and the entire cell protoplasm and nuclei are less tingeable than in the non-pregnant mucosa. Occasionally a gland may be seen in which this peculiar transformation is in progress, part of the gland being unchanged and another part showing the Opitz-Gebhard proliferation. The lumina of the glands in early months of pregnancy are usually empty,

although occasionally they may contain a little mucus or cellular debris. As the pregnancy advances a desquamation begins which finally ends in a necrobiotic change or, according to other investigators, a fatty degeneration. A certain amount of epithelium, however, always remains and from it is regenerated the glandular epithelium after pregnancy.

The glandular changes, even the Opitz glands, are not absolutely pathognomonic of pregnancy, as almost similar histological pictures may be produced by other conditions. Occasionally in the non-gravid endometrium, the deepest portion of a gland will be found penetrating the uterine musculature. This portion of the gland, i. e., that part which is in the uterine muscle, does not take on any of the characteristics of pregnancy, but remains unchanged.

The decidual cell. This cell is the derivative of the stroma cell. This fact has been proven by the work of Leopold (Verh. d. deutschen Gesell. f. Gyn., iii, 257, 1890) Hegar (Monat. f. Geburtskunde, xxi. Supplement heft 1–66, 1863) and others. For some years there was doubt as to the connective tissue origin of the decidual cell but it is now accepted. The transformation of the stoma cell to the decidual cell occurs very early in pregnancy. The compact layer of the decidua is made up almost entirely

Fig. 1. Endometrium during the postmenstrual period. The glands run a straight course, perpendicular to the surface. The lumen of each gland is extremely narrow and empty.

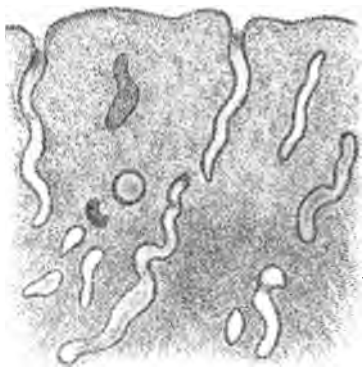

Fig. 2. Endometrium during the interval. The upper portion of the stroma shows œdema. The lumina of the glands are distinctly wider than in the preceding stage, and have assumed the cork-screw shape. Some of the glands contain a thready substance, taking the eosin stain.

of these cells. A less marked change is found in the superficial portions of the spongy layer while in its deeper portions, i. e., that portion which is in direct contact with the uterine muscle, practically no change is seen in its stroma cells. As a result of pregnancy these cells, especially those in the superficial layers of the mucosa enlarge, becoming five or six times their original size. As the cells enlarge they exert pressure upon one another and become mutually flattened, as a result of which they assume more or less polyhedral outlines. The cell outline is somewhat indistinct, but can be recognized. The protoplasm is finely granular. The nuclei are slightly larger than the nuclei of the non-gravid stroma cell. It is a characteristic of the decidual cell, that the increase in size concerns the protoplasm more than the nucleus. Occasionally cells are seen which contain two nuclei. The protoplasm stains palely and the nuclei are distinctly less tingeable than before pregnancy. The appearance of a field of decidual cells is pale and translucent and the cells which were originally spindle-shaped are now oval and have oval nuclei. Decidual cells are as a rule rather uniform in size.

As has been shown, the decidual formation is limited to the uterine cavity. It is, however, worthy of note that peculiar decidua-like areas are not infrequently found on the posterior surface of the uterus, the surface of the ovary,

Fig. 3. Endometrium during the premenstrual stage. The superficial compact and deep spongy layers are easily recognized. The glands are irregular in shape and their lumina are still wider than those of the interval. Many of the glands contain mucus.

and in the peritoneum of the cul-de-sac. These changes have been pointed out by a number of observers, notably Schmorl (Monat. f. Geb. und. Gyn., v. 46, 1897) and Rob and Myer (Quoted by Ruge, Gyn. Diag., p. 195). Macroscopically, the areas appear as small opaque spots scattered over the peritoneum or ovary and at first glance, look not at all unlike miliary tubercles. When examined microscopically, each of these areas is seen to be composed of cells which are the prototype of typical decidua cells. They are derivatives of the peritoneal endothelium or germinal cells of the ovary and are considered as a normal reaction due to the stimulation of pregnancy. These decidua-like areas are not constant and it is better to limit the term decidua to those changes taking place in the endometrium as the result of pregnancy.

The intercellular substance, which in the non-pregnant state consists of a finely granular network, becomes less distinct. It is of the utmost importance to remember that the decidual transformation takes place uniformly throughout the entire corporeal endometrium and that the decidual cells will be found arranged regularly, often in rows, at certain relative depths in the mucosa. This is of especial importance in making the differential diagnosis between the decidua and various pathological lesions which often produce swelling and œdema of localized clusters or groups of cells. The decidua basilaris differs but slightly in its histological characteristics from the decidua vera, except that it is penetrated by fœtal elements. If the fœtus die in utero or be expelled, certain changes take place in the decidual cells which are characteristic. The cell outline becomes clear and distinct, the nuclei shrink and become more tingeable, the protoplasm becomes translucent and almost homogeneous in appearance.

Blood-vessels of the decidua. The blood-vessels of the decidua are quite different from the blood-vessels of the endometrium. The decidua is very vascular and this is especially true of the decidua basilaris. Here the vessels are present in great numbers. The

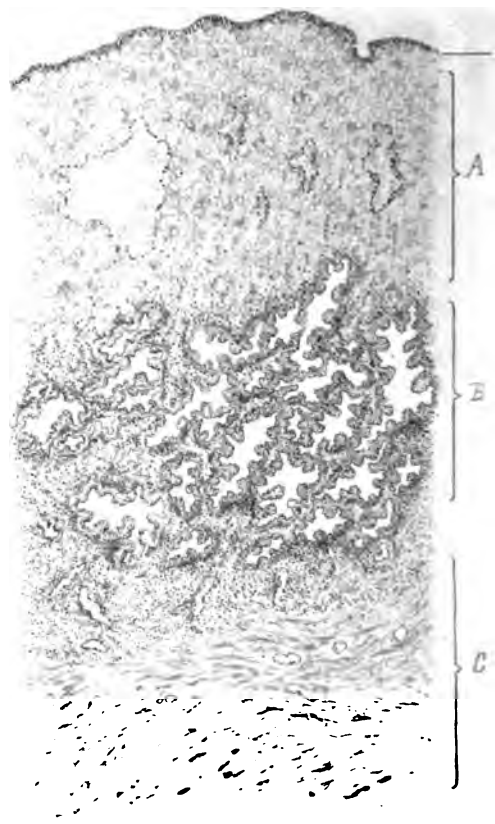

Fig. 4. The decidua of intrauterine pregnancy. A, Compact layer; B, Spongy layer; C, Muscle.

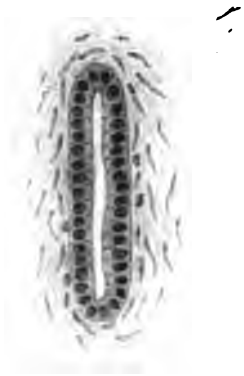

Fig. 5. Gland epithelium during the postmenstrual stage. The cells are low and narrow and the nucleus occupies a large portion of the cell. The lumen of the gland is very narrow and completely empty.

arteries pursue a tortuous, spiral course. The veins are dilated and both veins and arteries are often found penetrating the entire thickness of the mucosa. Many large sinuses are present. For a detailed description of the method of the establishment of the junction between the maternal and fœtal circulation and the intervillous spaces, the reader is referred to Peters' (Ueber die Einbettung des menschlichen Eies. Wein. 1, 899), and His' (Anat. menschlichen Embryonen, Leipzig, 1880–85) works and Grosser's excellent book, The Placenta. The vessels of the decidua are peculiar in that their walls are entirely lacking in muscular elements, being made of only endothelium which, however, is not so delicate and thin as the capillaries of the non-gravid endometrium. Occasionally large blood spaces are seen.

At the end of pregnancy, the decidua, as its name indicates, is cast off wholly or in part, either as an entire membrane or in shreds. The latter is the more common. A portion of the deeper layers always remains, and from this the process of regeneration takes place.

The decidua of extra-uterine pregnancy. Membranes are often submitted to the pathologist for a diagnosis between intra- and extra-uterine pregnancy. In tubal pregnancy, the uterine decidua may be expelled either as a cast of the uterine cavity or in small pieces. When this occurs, the differential diagnosis between an intra-uterine pregnancy and a tubal gestation can sometimes be made by the macroscopic appearance of the membrane. The decidua of tubal pregnancy is often quite thick (1 cm. or more). It may be expelled in shreds, but more commonly as one or two pieces which conform to the outline of the uterine cavity. Hence it is usually triangular in shape. The tubal and cervical openings can be easily distinguished. The outer surface has a rough, shaggy appearance and may be partially covered by laminated blood clots. The inner surface shows numerous small crypts or depressions and is often coated with coagulated blood.

The recognition of the membrane as decidua presents no difficulties, but the diagnosis between a tubal pregnancy, an abortion, or a menstrual decidua (exfoliative endometritis) is often difficult, especially since these specimens when presented to the pathologist are rarely fresh and have often been improperly preserved. If the membrane contains an ovum, the diagnosis is at once assured. In cases of exfoliative endometritis, the clinical history will be of great service. Even at best with such membranes, the macroscopic appearance of the specimen will be insufficient for a positive diagnosis and the microscope will be the court of last resort. The formation of a uterine decidua in cases of tubal pregnancy is completed at two or two and a half months.

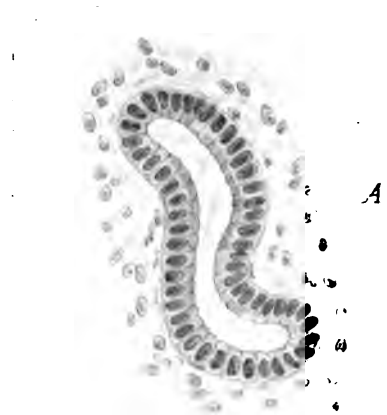

Fig. 6. Glandular epithelium during the interval. The cells have become higher and broader and at "A" show an inner granular and outer homogeneous zone. The nuclei are well stained and are situated at the base of the cells. The lumen of the gland is dilated and contains a thready material.

Histologically, the two decidua are said to present certain differences. In the decidua of extra-uterine pregnancy, the decidual cells are smaller. The cells do not become mutually flattened, but retain almost their original oval outline. The nuclei are but very slightly larger than the nuclei found in the non-gravid endometrium. In addition to this, as the decidua is not as a rule thrown off in extra-uterine pregnancy until the death of the fœtus, the decidual cells show the characteristic changes of fœtal death. These changes have already been described. It is also claimed that the surface of the decidua, spontaneously expelled from cases of tubal pregnancy, often shows depressions. These are explained on the ground that the inner surface of such a membrane is not smooth but shows deep crypts. It is thought by Abel (Gyn. Path. Abel-Bandler, p. 84) that at the height of those fields formed by the grooves, a star shaped, divided vessel is present. The blood-vessel changes in the decidua of a tubal pregnancy are the same as those of a normal pregnancy. The compact layer contains numerous vessels, the walls of which are composed of endothelium. In the deeper portions, the vessels are larger. Near the surface, the vessels often run parallel to it and are comparatively straight. In the deep portions, they are tortuous.

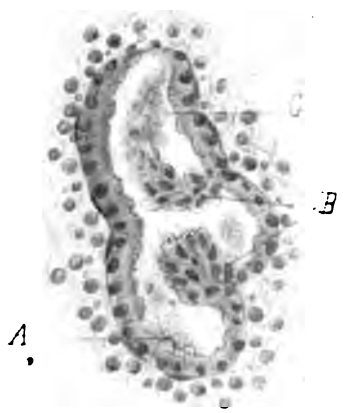

Fig. 7. Glandular epithelium during the late pre menstrual stage. The individual cells are indistinctly differentiated from one another. The cells have become much broader, and their inner contour irregular. In some areas (A) the inner aspect of the cells appears broken, with discharge of their contents into the lumen of the gland. At "B" there has been a proliferation of the cells. C, Mucus.

Fig. 8. Typical Opitz-Gebhard glands, showing fern-like ingrowths of prolferating epthelium. Note that the general character of this gland is similar to that of the premenstrual stage, only in this case the changes are more advanced.

Even under the most favorable circumstances the diagnosis between intra-uterine and tubal gestation from the decidua alone is extremely difficult, since at best it is simply a question of degree, and for this reason and because of the serious consequences often dependent upon such a diagnosis, it is better for the microscopist to refuse to make a positive diagnosis in these cases unless he finds fœtal elements and even then the possibility of a combination of intra- and extra-uterine pregnancy must be borne in mind.

Intercellular substance. For the purposes of study of this portion of the endometrium Hörmann (Arch. f. Gyn., bd. 86, ii, 2, 1908), recommends Bielschowsky's silver stain. The intercellular network which has its origin from the protoplasmic processes of the stroma cells, interlace and in many cases overlie one another, forming in some areas distinct bridges. A second variety of intercellular substance consists of delicate fibrils which constitute a more or less dense reticulum or network, between the meshes of which the stroma cells are lodged. This "intercellular fibrillar collagenous fibroreticulum" as it is termed by Hörmann, varies considerably in density in different parts of the endometrium.

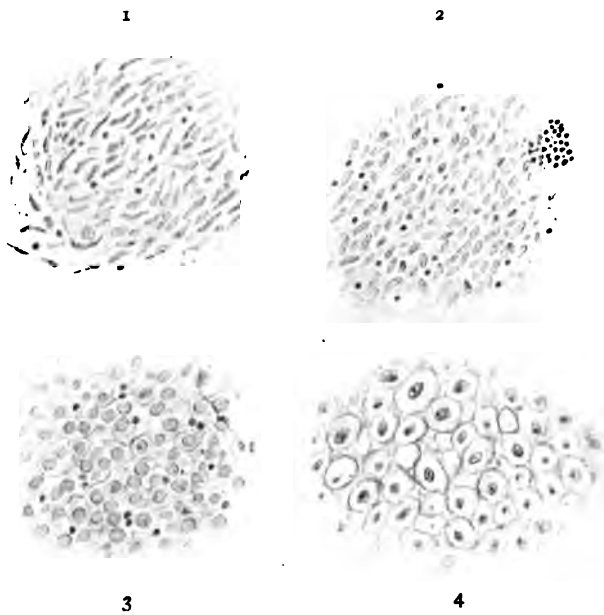

Fig. 9. 1. Stroma cells in postmenstrual stage. 2. Stroma cells during interval, showing collection of small round cells. 3. Stroma cells during late premenstrual stage. 4. Decidua cells.

The two points where it is constantly found in its greatest density are immediately beneath the surface epithelium and surrounding the glands. This constitutes the basement membrane or membrana propria of many authors. As a rule the further away the field is from any epithelium, the less intercellular material will be found. According to some investigators, the intercellular substance is formed in great abundance in the mucosa of the fœtus and child, while in the adult, the meshes are more loosely arranged and the individual fibers are coarser. A delicate collagenous fibroreticulum is present in the compact layer of the decidua.

Differentiation between endometritis and the changes found in the normal endometrium. For the last few years there has been considerable discussion as to the proper use of the term endometritis, one side claiming that the word should be applied only to those cases in which the endometrium showed distinct, active histological evidences of inflammation; the other side believing that endometritis should embrace practically all changes found in the mucosa of the uterus except actual tumor formation. This latter was the conclusion arrived at by a committee appointed by the American Gynecological Association in 1907 (Am. Journal of the Med. Assoc., 1907, xlviii, 1, 1002). Using the term endometritis in this sense, there is little doubt that numerous endometrii have been classified as glandular or interstitial endometritis, which were in reality nothing but normal cases, the tissue having been classified as glandular when examined in the premenstrual period, and interstititial when it has been removed in the postmenstrual period. If the pathologist wishes to adhere to the broader use of the term endometritis, he should know in which period the endometrium he is examining has been removed, and a knowledge of this would undoubtedly be of value in studying all cases. We have found from a study of our cases that even those endometrii which show active inflammatory changes and which are in the strictest sense of the word endometritii, possess a very decided tendency towards glandular changes if examined during the premenstrual period, and the majority of those which are classified as interstitial have been removed in the postmenstrual period. Exactly how far a thorough knowledge of the changes which the normal endometrium undergoes will extend towards doing away with the term glandular and interstitial, it is difficult to state, but it is certainly a strong argument for

the present tendency towards the simplification of the classification of endometritis into acute and chronic.

The numerous classifications of endometritis which are now in use are very faulty and a simplification is badly needed. The terms glandular endometritis, glandular hyperplasia, polypoid, fungoid endometritis, etc., are as confusing to the general practitioner as they are to the student. In the authors' opinion, it is far better to limit the term endometritis to those cases which show active inflammatory changes and to do away entirely with such terms as glandular or polypoid endometritis, adopting simply the terms acute and chronic. It is well known that, apart from the physiological change found in the endometrium, the various inflammatory processes which are known as polypoid, fungoid, glandular endometritis, etc., are not distinct conditions but are variations in a common process.

Throughout this paper the term endometritis has been used as signifying the mucosa of the body of the uterus. When the cervical mucosa has been mentioned it has been referred to as cervical.

CONCLUSIONS

1. The endometrium in the normally menstruating woman undergoes a complete and definite cycle every twenty-eight days.

2. For the purpose of study, this cycle is best divided into four periods which blend into each other. During the period which constitutes the premenstrual process, the endometrium takes on all of the changes common to the decidua vera at a very early stage, only at this time the changes are of a lesser degree. As soon as free hæmorrhage occurs, the congestion is relieved. The postmenstrual and interval periods constitute a process of repair. Each of these periods possesses definite histological characteristics, the most typical changes being found in the premenstrual and postmenstrual periods.

3. As has been said, the periods blend into each other and are subject to slight variations in different individuals. The menstrual period lasts from four to six days, the postmenstrual three to five days, the interval from ten to twelve days, and the premenstrual about ten days.

4. It is therefore important that the pathologist, when examining endometrium, should know when the last menstrual period occurred.

This knowledge, combined with an understanding of the changes during the various transformations of the normal endometrium, will show that many of the cases diagnosed as glandular or interstitial endometritis are nothing more than different periods of the normal endometrium, and consequently, that endometritis, in the true sense of the term, is much less frequent than is commonly thought.

5. In the classification of endometritis, we would recommend its division into acute and chronic, doing away with the cumbersome and faulty classifications which are now used.

PULSATING EXOPHTHALMOS; LIGATION OF THE INTERNAL CAROTID; RECOVERY[1]

By A. E. HALSTEAD, M. D. and A. J. BENDER, M. D., Chicago, Illinois

Mr. B., single, age 24, and by occupation a farmer, first came under observation on August 27, 1909, when he was admitted to the Illinois Charitable Eye and Ear Infirmary, when the following history was obtained: On January 27, 1909, the wheel of a loaded wagon passed over the patient's head just back of the left eye. He was unconscious for three days following the accident. So far as he can tell the eye bulged much more at that time than it did when he entered the infirmary, the left eye turning sharply towards the nose; the eye appeared paralyzed, the lids were swollen and he could not close the upper lid, move his jaw or tongue or swallow. Roaring noises synchronous with the heart beat could be heard from the time the patient regained consciousness until he entered the hospital. He remained in bed two weeks following the accident and during that time the sight in his left eye was very much impaired.

An examination of the left eye was made on August 27th. The left eye turned in 45°. The eye was very prominent and two-thirds inch farther forward than the right eye. The veins on the outside of the upper lid were very large and tortuous. The blood-vessels of the sclera were also enlarged. The cornea was injected and over an area four millimeters square, in its center, there was a fairly dense cicatrix. The anterior chamber was shallow, the iris not quite perfectly round, but normal in color. Vision at this time was R. E. 20/30–3; L. E. 20/120. On September 28th, the vision was again taken when it was found to be 20/20 in the R. E. and 20/50 in the L. E.

On October 10th the patient entered St. Luke's Hospital and was referred to Dr. Halstead's service. At this time the left eyeball protruded forward and deviated inward; the blood-vessels of the eyelid and eyeball were enlarged and tortuous; a pulsating tumor could be felt over the lid and in the inner angle of the eye; a bruit could he heard over the left temporal region and the patient complained of constant roaring noises, heard most distinctly in the left ear and synchronous with the heart beat.

On October 14th Dr. Halstead ligated the left internal carotid near its origin. An incision was made along the anterior border of the sternocleido-mastoid muscle. The blood-vessels were exposed and the internal carotid artery identified by making traction on a ligature passed around it, and feeling for the pulsation in the orbital tumor which had disappeared. The artery was now doubly ligated with chromicized catgut and the skin closed with silkworm gut.

October 15th, the day following the operation, the exophthalmos was not so marked as it was before the operation, the bruit had disappeared, and a very slight pulsation could be detected only at the inner angle of the left eye, while the head noises and ringing in the ears were absent.

October 16th the patient complained of constant pain in his left eyeball.

October 18th the bruit remained absent, the pulsation at the inner angle was scarcely perceptible, and the exophthalmos had slightly decreased. The patient complained of stiffness of the lower jaw.

Up to the present time there has been no return of the bruit or head noises. The left eye still turns inward, there is some exophthalmos and the patient occasionally complains of pain in the left eye.

The disease known as pulsating exophthalmos is in the majority of cases traumatic in

origin, usually unilateral and is characterized by exophthalmos, pulsation, bruit, and ringing noises in the head.

The etiology in about 70 per cent of cases is traumatism, such as a blow on the head, or, in Bernard's case (Annals of Surgery, vol. 39), a gunshot wound.

The remaining 30 per cent are spontaneous in origin, occurring in the course of diseases of the blood-vessel walls, such as in chronic endarteritis.

The symptoms are characteristic, the most

[1] Read before the Chicago Surgical Society, November 5, 1909. See discussion, page 101.

prominent being protrusion of the eyeball, the axis of which, when there is paralysis of the ocular muscle, deviates and its motility is impaired. The eyelids become swollen and œdematous. A pulsating tumor can be felt at the inner angle which is soft and reducible. A bruit can be heard over the pulsating tumor and over the temporal region on the affected side. The blood-vessels of the lids, bulb, and retina become enlarged and tortuous.

The pathological changes which have been found in different post-mortems are: traumatic aneurism of the cranial portion of the internal carotid artery, an arteriovenous communication between the internal carotid artery and the cavernous sinus, aneurism of the ophthalmic artery, and varicosed condition of the superior ophthalmic vein. Revington (Medico-Chirurgical Transactions, 1875, vol. 58, p. 183), in recording twelve post-mortem examinations, found in no case simple traumatic aneurism of the internal carotid artery. In six cases there was an arteriovenous communication between the internal carotid and the cavernous sinus. In eight the superior ophthalmic vein was varicosed, in one an aneurism of the ophthalmic artery, and in one simple dilatation of the internal carotid. These lesions are often associated with diseased conditions of the blood-vessel walls and fracture at the base of the skull. In four out of nineteen post-mortems collected by Sattler (Handbuch der Augen Heilkunde, 1887) an arteriovenous aneurism was found with a tear of the artery in the cavernous sinus.

The treatment consists in lowering the blood pressure in the internal carotid artery, which may be done by ligation of the common or internal carotid or by digital compression. Digital compression is indicated in cases where surgical interference is contraindicated as in disease or old age. Ligation of the common carotid was first performed for the correction of this disease in 1809. Murry (Annals of Surgery, vol. 39) recommends that the internal carotid rather than the common carotid be ligated as there is less tendency to recur.

Boden in 1899 collected all the cases treated (Deutsche Zeitschrift fur Chirurgie, bd. 51) by ligation of one and both common carotids. Of those in which one common carotid was ligated there were fifty-eight cases and of these twenty-six were cured, twenty improved, six unimproved, and six died. Among the five in which both common carotids were ligated, there was only one death; the remaining four being either cured or improved. Murry (Annals of Surgery, vol. 39) mentions two cases, those of Dollinger, and Woodward, in which after both common carotids were ligated, the symptoms returned but subsided after ligation and resection of a portion of the superior ophthalmic veins.

THE SACCULAR THEORY OF HERNIA, WITH REPORT OF A CASE[1]

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THE report of the following case may be of interest to the supporters of the saccular theory of hernia and it lends itself specially to the views of Russell as enunciated in the Journal for November, 1907. R. L., aet. 13, was brought to the Western Infirmary Out-patient Department in May, 1908, on account of a swelling on the left side of the scrotum which had been present from birth but which had diminished somewhat during the last six years. The swelling was a hydrocele of the tunica vaginalis; at its upper part there was an independent globular mass which was considered to be an encysted hydrocele of the cord.

The cord was thickened to some extent — a feature commonly found accompanying hydrocele in children and representing the remains of the processus vaginalis. Signs of hernia were absent.

The operation took place during May in the out-patient theatre and the boy went home immediately afterwards. It was found that the main mass of the scrotal swelling was a hydrocele of the tunica vaginalis. The part considered to be the encysted hydrocele of the cord was really the dilated and almost completely separated extremity of a peritoneal protrusion — the unobliterated remains of the processus vaginalis. This dilated sac lay mostly behind the tunica vaginalis which thus almost enveloped it. The processus vaginalis with its dilated end and the tunica vaginalis were separated from the testicle and the cord. The mass of tissue was divided immediately above the dilated "encysted" part, that which remained being treated as a hernial sac in Macewen's operation; a radical cure being then performed.

The tissue removed as seen in the picture consisted of most of the tunica vaginalis which was laid open from the front so the specimen appears like part of a plate on which rests a rounded swelling — the dilated end of the unobliterated processus vaginalis; the two sections were intimately fused. The smaller sac differed essentially from the end of the sac of an ordinary hernia which lies in front of the tunica vaginalis and is only loosely attached to it. The communication between the globular extremity and the prolongation from the peritoneum was by a minute opening which was just sufficiently small to prevent anything but the slightest quantity of fluid passing back into the peritoneum on pressure (see figure 2), so that the fact of a congenital hydrocele being present as well as a hydrocele of the tunica vaginalis escaped diagnosis. The progress of the case was uneventful; healing being by first intention.

Had this congenital sac been possessed of contents it would have been the typical and rare form of hernia known as infantile. The condition of the parts here will be readily admitted to be of congenital origin and they show conclusively also that an infantile hernia may be of congenital origin. There was no possibility of this being an acquired sac which had been forced down behind the tunica vaginalis. It may be said that till the child became seven years of age the congenital sac contained intra-abdominal contents; this may be admitted, in which case instead of a congenital hydrocele we must read congenital hernia.

The saccular theory of hernia finds support from numerous other facts. Besides the frequency with which, at post-mortem examinations (1), unoccupied peritoneal pouches are found, and the frequency of hernia in children, especially infants, before the advent of strain could come into play, may be instanced the fact that oblique inguinal herniæ in females are always congenital, because in them the broad ligament enters into the formation of the sac and this would not likely be the case were the sac acquired.

Again tubercular peritonitis with excess of fluid in the peritoneum often indicates its

[1] Read before a meeting of the Glasgow Medico-Chirurgical Society, December, 1908. Patient was shown.

Fig. 1.

presence without other symptoms by causing a hydrocele to become apparent. No one would aver that the very slight increase of intra-abdominal pressure due to a little ascites would be the means of producing a hernial sac so it must be admitted that the sac was pre-existent — was congenital. Even marked ascites does not do such a thing unless we accept the protrusion of the umbilicus as an instance of this nature. Further occasionally an intra-abdominal tumor grows down the inguinal canal yet no one would credit a tumor with the power to force a hernial protrusion. Thus in the dead we find the possibility of intra-abdominal contents entering pre-formed sacs and in the living intra-abdominal contents taking advantage of such congenital sacs. In certain developing herniæ we see the contents running down obviously narrow and slender sacs whereas we would expect if the protrusion were the cause of the sac formation (as for instance in ventral hernia after laparotomy) it would not be a slender process but would have a blunt and bulky form just as we get in herniæ starting from a funnel-shaped protrusion. In many operations on hydrocele in infants if we look we find remains of the processus vaginalis and it is an easy inference to say that there will be in such cases a funnel-shaped process of peritoneum entering the internal ring and awaiting some increase in intra-abdominal tension to develop into a hernia of the ordinary acquired type. During operation on hernia in infants it becomes increasingly clear that there is no other difference between congenital hernia or hernia in a sac separate from the tunica vaginalis except the fact of that separation. During operation on many bubonoceles we find a slender unoccupied part of the sac entering the scrotum and again only awaiting the descent of the more bulky contents. Bevan (2) has recently referred to cases where hernia after radical cure has recurred very quickly as being due to the presence of two sacs, or one sac with two sleeves. He has recently discovered such a condition during operation. Finally the success of the operation for the cure of hernia in children which effectively obliterates the sac goes a long way to prove that the essential factor in the production of a hernia is the presence of a pre-existent sac. The saccular theory has therefore an important bearing upon treatment and supports the view that hernia in infants ought to be operated upon and that the operation should principally deal with the sac. The view that many of these herniæ in children cure themselves spontaneously finds its retort in the fact that congenital pouches are so commonly found post-mortem and so commonly become distended by ascitic fluid. It is, of course, one thing to prove that some herniæ form because of the pre-existence of pouches and another to prove that all herniæ form because of such pouches, still the frequency of finding sacs awaiting contents in adults as well as in children is very convincing when taken along with other evidence in favor of it, of the correctness of the saccular theory.

Another point of interest in the case was the fact that recovery was uninterrupted although the boy was treated as an out-patient. All children who can be carried home and can receive a reasonable amount of attention are suitable for a radical cure in an out-patient department. The danger of operating upon hernia is perhaps twofold. To prevent sepsis

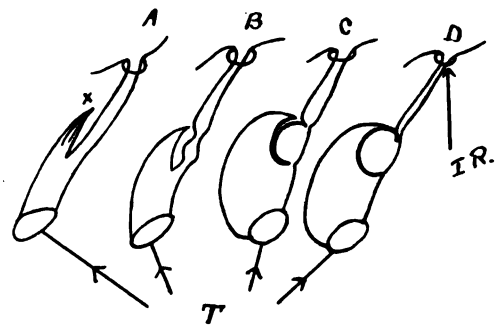

Fig. 2.

following operation, means may be as effectively taken in the out-patient as in the ward theatre. Subsequent soiling of the wound can be prevented by an efficient dressing. That recommended consists in covering the minute wound (in an infant from one-half to one inch suffices) with a small pad of gauze and sealing it in completely with rubber adhesive plaster which may remain on for a week. This protects the wound from the action or effects of urine and from other outside contaminations. It is comfortable, so there is little tendency for the child to interfere with the dressing. The other danger and the one specially feared in the out-patient treatment of hernia is the bursting up of the stitches. The fixation accorded by a dressing covered in by adhesive plaster will amply protect the external stitches against all interference from mere movement. With regard to the internal stitches movement during transit home could possibly be the means of their giving way. Yet the stress from rough movements while the child is being transported home is negligible when compared with that present during retching or even coughing. To avoid strain during urination all infants should be circumcised previous to operation for hernia. It is often noticed that a chronic cough is the exciting cause of hernia in a patient who had formerly been accustomed to strenuous labor. Further, if during examination for a possible hernia pressure be made upon the abdomen the protrusion fails to make its appearance till the child either cries or strains otherwise. Thus it is evident that the forces acting from within are much more effective in forcing a hernia into a sac or forming a sac *de novo* than are those applied from without. These forces are active alike in children in bed at home or in a ward. The requisite attention therefore implies retention of the little patient in bed while at home. As a matter of fact it is the obliteration of the sac and not the retention of the deep sutures on which depends the success of the radical cure. From experience, the home treatment of children operated upon for hernia in the out-patient theatre is found to interfere in no way with the success of the operation.

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NOMA

WITH THE REPORT OF A CASE THAT RECOVERED WITHOUT PERFORATION

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NOMA is a rare disease. Out of 13,000 cases admitted to the London Hospital for Sick Children there were only six cases of noma.

It is essentially a disease of young childhood, but has been observed in persons of all ages up to 70. It is more often seen in adults in India than in any other country. Nursing babies seem to be in great degree immune. Noma does not confine its ravages to the human race, but attacks the lower animals also.[1] Noma usually occurs in the mouth, but not infrequently attacks other parts, especially the vulva, the rectum, and the external auditory canal. Holt[2] saw five cases beginning in the auditory canal, apparently due to the use of the same syringe to clean the ears without disinfection. It is more frequent in girls than boys. Noma is especially apt to attack persons debilitated by previous or existing disease. Of the predisposing diseases, measles is by far the most important. Osler says that half the cases occur during the convalescence from measles. Noma has been known to occur,

[1] White and Blackwood, University of Pennsylvania Medical Bulletin, December, 1908.

[2] Crandon, Place, and Brown, Boston Medical and Surgical Journal, April 16, 1909.

however, in strong children and in healthy adults. While bad hygienic conditions seem to predispose to noma yet it has been known to occur in patients with the best hygienic surroundings. This is true of the case reported in this article.

That trying climates predispose to this disease seems proven, especially cold, damp climates.

There is good reason for believing that the indiscreet use of mercury predisposes to the development of noma. It is quite certain that diseased teeth, and especially gingivitis are important etiologic factors.

My patient had a severe pyorrhœa when she came to me and had had it some time before the development of the noma. The experience of Holt above mentioned, of Lund, of Siebert, and especially that of Blumer and MacFarland in the Albany Orphan Asylum leave no doubt in my mind of the contagiousness of noma. It is equally certain, on the other hand, that it is only slightly contagious.

While we are not in a position to say just what germ or germs produce noma, I think we are warranted in saying that it is a germ disease, but that the germ or germs producing it require a peculiarly prepared soil, hence the conclusion that it is contagious, but only slightly so.

As above stated the bacteriology of noma is as yet not fully understood. The weight of evidence seems to be in favor of the theory that noma is "due to the combined action of bacteria from the mouth acting upon specially vulnerable tissues."[3] Buday regards the symbiosis of a spirillum and fusiform bacillus of especial etiologic importance. The investigations of Perthes make it highly probable that the essential etiologic factor is an anærobic organism. The majority of investigators regard noma, ulcerative and gangrenous stomatitis, gingivitis, and Vincent's angina as identical processes differing only in degree. Some there are, however, notably Kissel,[4] who dissent from this view.

The investigations and experiments of Petruschky and Freymuth, and Passini and Leiner seem to prove that in some cases of noma diphtheria bacilli play an important etiologic role.

In the case herein reported the patient suffered from diphtheria two years before the attack of noma, and at that time had a gangrenous ulcer of the tongue, the resulting scar from which was plainly visible when the patient was brought to me.

The pathologic and microscopic anatomy of noma have been well worked out, the symptomatology thoroughly studied, and the physical signs carefully observed and noted, hence the diagnosis is easy.

Pneumonia is by far the most common complication, occurring in 58 out of 63 cases collected by Tourdes, and in 19 out of 21 cases examined by Barthez and Rilliet, and is the immediate cause of death in practically all fatal cases. Coincident gangrene in other parts of the body is not infrequent. Severe and even fatal hæmorrhage has been observed, but this is a rare complication. All observers agree that noma is usually fatal and that in the majority of cases which recover the deformity is frightful. Recovery is slow when it does occur. Toothlessness and defective speech are common results in cases that recover. Relapses sometimes occur after convalescence seems well established. Extreme youth, old age, bad hygienic surroundings, extensive involvement of the tissues, and bad general health influence the prognosis unfavorably. This is true of complications also, especially pneumonia. Other things being equal, the longer the patient survives the more likelihood of ultimate recovery. Noma of the auditory canal and genitalia seem to be especially fatal. Whether we agree with Crandon, Place, and Brown, in their opinion that noma is not contagious, or with Weaver and Tunnicliff who hold the contrary view, it is certainly wise to isolate all cases. In view of the frightful mortality every precaution should be taken to prevent the occurrence of the disease.

The mouths of delicate children should be carefully looked after and kept clean. Especial attention should be given to the mouths, ears, and genitalia of sick children, especially those suffering from measles, diphtheria, typhoid fever, or any form of stomatitis, or gingivitis.

[3] Weaver and Tunnicliff, Journal of Infectious Diseases, January 1, 1907.

[4] Journal A. M. A. (ab.) vol. xlv., p. 1994.

Of scarcely less importance than the local measures in preventing the disease are those looking toward the general condition of the child, such as good food, proper clothing, and pure air — in a word, good hygienic conditions. My own experience in the treatment of noma is limited to two cases. The one herewith reported and one other seen with the late Dr. A. E. Vanbuskirk. In both recovery ensued, and in neither was either the knife or cautery used. This experience is, of course, entirely too small to base conclusions upon, but this experience together with a careful study of the literature of the subject compels me to dissent from the view so generally expressed that excision or the use of the cautery or both is the best means of arresting the disease. The general condition of the patient seems to play almost, if not quite, as important an etiologic role as do micro-organisms. This opinion is given additional support by the fact that relapses not infrequently occur and that plastic operations for the relief of deformity due to noma are apt to lead to extensive sloughing if undertaken too early. It would seem therefore, that the knife and cautery should be used only in the cases seen early, before much destruction of tissues has occurred and in those cases in which the general condition of the patient is fairly good. In the case herein reported anything like what is generally described as an adequate use of the knife and cautery would have resulted in the loss of a large part of the cheek, whereas under the treatment used no perforation occurred and hence there is no deformity. In the other case seen by me there was a moderate destruction of the lower lip which could easily have been restored. The seeming importance of the B. fusiformis in the production of noma and the fact that this bacillus is anærobic would suggest the use of peroxide of hydrogen in the prophylactic as well as the curative treatment of the disease. This was borne out in the experience of Crandon, Place, and Brown, and in my own. Permit me to recall here the fact that most of these patients die from pneumonia.

The writer would therefore urge the employment of the open air treatment, together with forced feeding and the frequent local use of peroxide of hydrogen, reserving the use of the knife and cautery for the cases wherein the disease may be eradicated without too great a sacrifice of tissue and wherein the clinical features seem to point to the micro-organisms as the chief etiologic factors rather than the generally impoverished condition of the patient.

When the bacteriology of the disease is known we may expect good effects from the vaccine treatment. In my own case this was employed, but without striking results, and inasmuch as there was a slight relapse, after the patient went to her home, from which she recovered without the vaccines, I do not feel warranted in giving them much credit for the result in this case. In conclusion I would especially refer those interested in this subject to the excellent papers of Weaver and Tunnicliff, and Crandon, Place, and Brown, both of which have been already referred to in this paper.

AUTHOR'S CASE

The following case was referred to me by Dr. Reid of Van Wert, Ohio, and was seen by me first on May 30, 1909, at the Hope Hospital:

H. E., female, 15 years, school girl. Family history negative. She has had all children's diseases, and has been sick most of the time since she was eight years old. Two years ago she had diphtheria, and has not been well since. During the attack of diphtheria she had a gangrenous ulcer of the tongue the scar resulting from which is plainly visible now. During this illness there was a slight menstrual discharge, the first and only one she has had. Some pyorrhœa had existed for some weeks before present trouble came on. Two weeks prior to her entrance to the hospital her face on the right side began to swell and she noticed a "canker" on the inside of the cheek. Cheek was quite sore and painful and teeth were quite loose. She complained of some difficulty in swallowing. She had been losing weight for a month.

Examination shows a large, immature girl, rather poorly nourished, skin and mucous membranes pale. Cheek is much swollen and glossy, partially closing eye of same side. Over the most prominent part of the swelling there is a cyanotic area. The whole cheek is tender and hard. On the inside of the cheek extending from the ramus of the jaw to within a half inch of the corner of the mouth, is an ulcer covered with a grayish-yellow slough. All the teeth are loose, gums are sore, pus escapes on pressure from around the roots of the teeth, salivation marked, breath extremely fetid. Temperature 99½ degrees F., pulse 116 per minute, regular, but with little volume or force.

Patient is not confined to bed, but tires easily and lies down most of the time. Appetite is fair. The urine was found to be normal. The blood examination showed 26,880 white cells, 56 per cent polynuclears, large lymphocytes 9 per cent, small lymphocytes 31.5 per cent, transitionals 2.5 per cent, eosinophiles 1 per cent.

Dr. Rhamy's report on the bacteriologic findings is as follows: "Smears from this case show many short and long bacilli, pointed at the ends and thicker in the middle, which decolorize by the Gram method. There are also present a few streptococci and leptothrix and a moderate number of spirochæte resembling the spirochæte dentium. Cultures showed a luxuriant growth of an ærobic bacillus, decolorizing by Gram, and a few streptococci. This bacillus is evidently that described under the name of bacillus fusiformis and occurs in ulcerative lesions of the mouth." The patient was kept in bed with the windows wide open and during the day she was kept on the porch. She was given a liberal diet and in addition to the regular meals she was given a glass of milk with an egg and two drams of rum three times daily. She was also given the juice of three lemons daily. Every three hours the mouth was washed with peroxide of hydrogen with the aid of a dropper to insure a thorough washing of the nomatous area. After four days of this treatment there seemed to be some general improvement, the nomatous area had not spread and the cyanosis of the cheek was less marked. I now concluded that we had better substitute a bichloride solution 1-5000 for the peroxide because of its superior germicidal power. The other treatment was continued. After one day's use of bichloride the pain was greater and the cheek seemed more swollen. The treatment was not changed however, until three days later, when, after a talk in Atlantic City where I had gone to attend the meeting of the A. M. A., with Dr. W. A. Pusey of Chicago, who said he thought the weight of evidence was in favor of the trouble being due to an anærobic micro-organism, and recalling the apparent change for the worse when the bichloride was substituted for the peroxide, I telegraphed Dr. Weaver, my assistant, to stop the use of the bichloride and resume the use of the peroxide. After this the treatment was not changed except that four injections of bacillus fusiformis were given, one of 50 m. on June 8th, 33⅓ m. on June 12th, 25 m. on June 16th, and 25 m. on June 21st. On the sixth day of her stay at the hospital a diarrhœa developed which was checked by a few doses of opium and bismuth. The ulcer extended until it reached the corner of the mouth, but in no other direction was there any extension of the nomatous process after she entered the hospital. Shreds of necrosed tissue were washed away or gently removed by the forceps daily. On my return from Atlantic City I found the patient much improved both as to her general health and the local condition save that the ulcer extended to the corner of the mouth. Perforation did not occur. On June 27th (29 days after she entered the hospital, and 42 days after the onset of the disease) she was discharged with the ulcer entirely clean of necrosed tissue and rapidly healing. A few days after her return home there was a slight relapse evidenced by pain, swelling, and a dirty appearance of the ulcer, but this soon disappeared and about two weeks later when I saw her the ulcer was nearly healed. She was feeling well, but was still rather easily tired and was decidedly anæmic. The pyorrhœa was not any better. A slight elevation of temperature most marked in the evening was nearly constant until convalescence was established. On five occasions it was normal in the morning and on one, one-half degrees below normal. The highest temperature recorded was 101⅘ degrees F. on the 33d day of the illness. The pulse was feeble and ranged from 100 to 116 per minute save on five occasions when it was recorded at from 84 to 98 per minute. There were no changes in the clinical aspects of the case as a result of the injections of the bacilli. No examinations were made to determine the effect, if any, of the injections of the bacilli upon the blood.

Dr. Reid, the patient's physician, under date of October 1, 1909, writes of the case as follows:

"She came home weighing 81 pounds — she now weighs 102 pounds. She is feeling pretty good and I allow her to attend school half a day — I thought best to not let her go all day.

"The sore is not entirely healed, however, it is much smaller and the adhesions that formed have broken up so the cheek is fairly freely movable. She cannot open the mouth very well, but much better than she did. The gums still recede from the teeth and the teeth are loose. The breath no longer has the foul odor. The cheek is swollen some but not enough to attract attention. The red spot on the cheek has disappeared and her color is tolerably good. She has a good appetite. I anticipate complete recovery so far as the noma is concerned.

"The cheek has softened and become more pliable. The cicatrix is less noticeable since the adhesions that formed seemed to give way."

THE BIER TREATMENT IN TUBERCULOUS JOINT DISEASE[1]

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SEVENTEEN years have elapsed since Bier announced in a few words to the Deutsche Gesellschaft für Chirurgie his results in the treatment of about twenty cases of joint tuberculosis by "Stauungshyperæmie."[2] Following this by numerous articles and at length by a book, Bier has again and again called attention to the treatment that bears his name, amplifying and extending his ideas as time went on. He has been joined by many others, and has been opposed by some, until the writings on the subject have attained great proportions, and his disciples have recommended the various forms of hyperæmia for almost every disease to which the human family is heir. Schools of medicine have been founded on less.

As with all other panaceas, so probably will it be with this. Extravagant praise will be succeeded by extravagant denunciation. If we can maintain an attitude of scientific scepticism, we may avoid either extreme, and may pick out and hold fast whatever good the treatment contains.

In this connection let me call your attention to a system of treatment brought forward by Jounod[3] in 1834, called Hæmospasie, which cured croup, tonsillitis, quinsy, cataract, paralysis, insanity, amenorrhæa, cholera, blindness, fractures, wry neck, anthrax, etc. The French Academy awarded Jounod, in 1870, the Grand Prize for Medicine and Surgery. "Supported," as he says, "by their suffrages," he read six papers to them on the various uses of his invention in anæmia, inflammation of the lungs, typhoid fever, gunshot wounds, and epidemic cholera. The treatment was recommended in 1870 to all the hospitals in France by the Minister of the Interior, and received medals at exhibitions in London, Paris, and New York. It consisted of drawing the blood by vacuum glasses (from some of which Bier's are copied) usually away from the diseased parts — derivation. It made the operator "master of the circulation." "The things done are like a miracle. They throw into profound astonishment the spectators and the sick ones." Yet how many of us have ever heard of hæmospasie?

In the first place, we must criticise the soundness of Bier's fundamental argument. He conceived his theory from the fact, first brought forward by Rokitomsky, that patients with heart lesions which cause pulmonary hyperæmia are practically immune to pulmonary tuberculosis. Post hoc ergo propter hoc. It is as rational to consider that persons with the "rheumatic diathesis" are as a rule not subject to tuberculosis, and vice versa; but even so, it is but a general rule. We have now under treatment at the Sea Breeze Hospital, a boy with a poorly compensated mitral lesion, who has gone through the regular four year course of treatment for Pott's disease, and yet his hands and feet are usually bluish red with venous congestion. Again, Bier condemns the use of so-called active hyperæmia in tuberculous joint lesions; but the pulmonary hyperæmia in mitral lesions is essentially an arterial one. On the other hand, a form of treatment may be good although the theory on which it is based is quite erroneous, and we will turn our attention from theory and attempt to get down to the facts.

Three forms of hyperæmia are recognized: 1st. Arterial or active hyperæmia, usually produced by hot air. 2d. Venous hyperæmia — "Stauungshyperæmie"— produced by the elastic ligature. 3d. Mixed hyperæmia, produced by cupping. Inasmuch as Bier condemns the use of the first in surgical tuberculosis, it ceases to be the Bier treatment as far as our subject is concerned, and we shall leave it out of consideration.

[2] Verhandlungen d. Deutschen Gesellschaft für Chirurgie, 1892, i, S. 91.

[3] Bonnard, De l'Hémospasie. Paris, 1840.
Jounod, Traité de l'Hémospasie. Paris, 1875.
Jounod, A Theoretical and Practical Treatise on Hæmospasia. Translated by Mrs. E. Howley Palmer, London, 1879.

[1] Read at a meeting of the Orthopedic Section of the New York Academy of Medicine, October 15, 1909.

The treatment by the elastic bandage was Bier's original method. At first he applied the bandage for a short time daily, with the layers one over the other, and bandaged the parts distal to the diseased area. Later he advocated the application of the bandage during practically the entire twenty-four hours; but on account of various untoward results, he abandoned this scheme and again advocates a shorter period, — from one to three hours daily. He uses an ordinary Esmarch bandage, about six centimeters wide, spreading the layers out so as not to exert undue pressure, and covering the skin, if it be sensitive, with gauze or muslin. The part of the limb distal to the lesion is not bandaged. All cases of joint tuberculosis, "open" or "closed," receive this treatment. If sinuses are present, he recommends cupping in addition. When abscesses form, he slits them open, applies cups, and continues the elastic bandage, regarding the abscess, not as a contraindication, but as an incident in the process of healing, as nature's effort, so to speak, to cast off the disease. He treats conservatively tuberculous joint disease in patients of all ages, and makes as his contraindications only amyloid degeneration, severe pulmonary tuberculosis, very large abscesses, and bad position of the limb. He has given up the use of iodoform except in the case of large abscesses filling up a joint. Here *Stauung* is not indicated. He uses no fixation nor extension apparatus, except in disease of the knee or foot. On these joints he applies plaster or a brace, which is worn only when the patient goes about. Knees he usually resects, for as a rule hyperæmia in disease of the knee is unsuccessful. The treatment must be continued for at least nine months and two cardinal rules must always be observed, viz., the hyperæmia must be warm, and it must be painless. Motion is permitted and even encouraged.

Mixed hyperæmia by cupping. This form of the treatment owes its elaboration largely to Bier's assistant, Klapp. The sterile glass cups, made in various shapes to fit the different regions of the body, and provided with rubber bulbs to exhaust the air, are applied over the mouths of the sinuses, and are left in position for about five minutes, then removed for three minutes, and then reapplied in a slightly different place to avoid pressure irritation. This is continued for three-quarters of an hour, at first daily, then every two or three days. Because of the tendency to the formation of tuberculous ulcers of the skin, the area to be cupped should be washed with benzine and then covered with equal parts of lanolin and vaselin before the cups are applied and afterward. Hofmann[1] found by microscopical examination of the granulations in the wall of the fistulæ, that cupping effected a widening of the walls of the vessels, and a washing out of leucocytes from the tissues, and Félegházi,[2] that great numbers of bacteria were drained out; and doubtless the good results of cupping, as others have pointed out, are due, not alone to hyperemia, but largely to the mechanical drainage which the suction compels. Klapp maintains that if abscesses are properly "hyperæmized" after opening, they will not become infected; but he considers it a crime to open them if hyperæmia be not subsequently regularly and persistently induced. In order to induce hyperæmia in a limb by suction, various glass chambers have been devised — "Saugapparate" — provided with a rubber tube and a suction pump, and having at their open end a loose soft rubber cuff. Through this cuff the limb is passed, and then made fast by an Esmarch bandage. The resulting hyperæmia is not only one by suction, but also one by constriction of the rubber bandage. This is the form most used to promote motion in an ankylosed joint, and good results are claimed for it in spina ventosa. In treating this latter the entire hand or foot is inserted into the apparatus. In using these suction apparatuses, the operator pumps out the air, and leaves the limb thus for a few minutes; then opens the valve and releases the pressure for twenty seconds to three minutes; and continues the treatment for from twenty minutes to a half hour, at first daily, later every two or three days.

Marked difference of opinion exists as to the rationale of the treatment. Bier considered inflammation as a benign process and regarded his treatment as an imitation of nature. The

[1] Münch. med. Woch., 1905, No. 39, 1864.
[2] Deut. Zeitsch. für Chir., xciii, 459.

carbonic acid in the venous blood kills the tubercle bacilli, according to his view. Hamburger thinks the increased alkalinity of the blood is responsible. Heller ascribes the results to a sort of tuberculin action through the retention of the products of tissue change in the blood. Büchner and v. Félegházi think that the accumulation of leucocytes is the essential feature; while Makara, Rosenberger, and others say that the treatment cures by the formation of connective tissue. In Nothnagel's Pathology[1] one learns that the results are due to the tuberculin action of the dammed back lymph, rather than to anything in the blood itself.

Many articles on Bier's treatment in bone and joint tuberculosis have appeared in the medical journals during the past few years, most of them by German writers, a large number by Americans and Englishmen, fewer by Frenchmen, and very few by Italians. As can be seen by the abstracts accompanying this article, the majority of the authors praise the treatment highly, some have found it of little use, and some, notably Koenig, condemn it. All agree that it has its dangers. It is claimed that the pain is soon relieved, and that the joints recover in a shorter time than under the old methods of treatment, and often with a good range of motion. Some find that it is more efficacious in closed tuberculosis than in open; but most find to the contrary. There is a practical unanimity on its relatively poor action in knee joint disease. Some use Bier's treatment combined with iodoform injections.

There are several considerations here that we must remember: 1st. Most cases of joint tuberculosis with or without conservative or radical treatment recover. 2d. There is always the liability to a mistake in diagnosis. A recent laboratory examination of about forty joints removed by various surgeons for tuberculosis, shows that in about one-third of the cases the diagnosis was erroneous, as has been pointed out in a recent paper; *and these were cases in which the operator has had a chance to correct his original diagnosis by examination at the time of operation.* A certain diagnosis is a very difficult matter. Even the examination under the microscope of tissue removed for diagnosis may be misleading, for tuberculosis can exist in one part of a joint and be absent in another. The tuberculin tests also are not final. The clinical diagnosis in a closed case of joint disease may furnish a good working basis for treatment, but when unsupported by positive microscopical findings or by the inoculation of a guinea-pig, it is quite inconclusive. 3d. In experimenting with a new form of treatment, one is much more liable to publish his results if they are affirmative than if they are negative or unfavorable. 4th. The joints that recover with good motion under the Bier treatment are notoriously those in which the same result is apt to follow other forms of treatment.

In considering, then, the use of the Bier treatment in joint tuberculosis, we see that it finds its greatest use in the upper extremity and in the ankle and tarsus. It is of less service in knee joint disease, and can not be applied in disease of the hip or of the spine.

My own experience with the treatment, while more or less limited,[2] and acquired almost entirely during the past year, has been favorable and warrants a continuance of the experiment. I have tried it in only two cases of closed tuberculosis for any length of time; in one of which, a knee, the rapid occurrence of a large abscess led me to discontinue it, contrary to Bier's advice. Several other patients on whom I started to apply the hyperæmia at the dispensary, soon ceased to attend. They have given me the impression that in early cases the treatment is not practicable for dispensary patients. They seem to want to see something done. In the cases with small sinuses, our results have been, as a rule, excellent, though, as the treatment has often been combined with other measures, it is hard to assign to it its exact proportion of credit. The treatment of uninfected abscesses by slitting and cupping we have not tried. It seems inferior to aspiration and injection. Since adopting Calot's method of treating cold abscesses only one or two have become infected at the Sea Breeze Hospital, and we have used it many times.

In the treatment of long, infected sinuses,

[1] Nothnagel. 1900, Wien, Alfred Hölder.

[2] I have full notes on eight cases only, 3 of disease of the calcaneum, 2 knees, 2 elbow, and 1 elbow and wrist. On other cases I have used it for a short time.

cupping must be compared with the injection of bismuth paste, with which also we have had excellent results.

In fact, the whole treatment must be compared with all the other methods of treatment of tuberculous joint disease which we possess, and by this comparison it must in the end stand or fall. It is still on trial. The eminence of its originator and of its advocates will insure for it a fair hearing; but even this will not save it from going the way of many predecessors if it be found wanting.

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KLAPP. Zeitschrift f. ärztliche Fortbildung, 1906, ix, 281. Die Behandlung lokaler Entzündungen durch Stauungshyperämie (mittels Stauungsbinde und Saugglas).

The use of the bandage is recommended for one to three hours daily. After instruction, the patient or his relatives may apply the treatment at home, returning every two weeks for supervision. No cold abscess should ever be opened unless hyperæmia be subsequently used. The cups are used when sinuses are present, applied for five minutes, and then removed for three minutes, for three-quarters of an hour daily. At first this is done every day; later every two or three days. The granulations soon take on a firm, bright red, healthy look, and the tissues themselves become firm and hard. He obtains excellent results in spina ventosa by inserting the whole hand in the vacuum glass once or twice a week.

KÖNIG. Tuberculose der menschlichen Gelenke. Hirschwald, Berlin, 1906.

S. 51. Wir haben bei unseren Versuchen mit Bier 'scher Stauung nichts von Heilung gesehen, was wir nicht bei unserer gewöhnlichen Behandlung in derselben Zeit auch beobachtet hatten. Dagegen haben wir unter Stauung die Entwicklung von Abscessen beobachtet und haben wiederholt Gelenke mit grossen Abscessen resecirt, welche anderwärts mit Stauung behandelt waren. Unsere Mittheilungen über die grössere Gefahr eitriger Tuberculosis sind nicht geeignet, solcher Behandlung das Wort zu reden.

K. VOGEL. Ueber Gelenktuberculose. Deut. Zeit. f. Chir., 1908, xcvii, p. 109.

Seventy-nine cases: 37 knees, 19 feet, 11 elbows, 12 hands. Of these all the elbows and feet which continued the treatment and could be followed up recovered. One patient with tuberculosis of the hand died of pulmonary tuberculosis. While the author was using Bier's treatment he excised or amputated only two elbows, two feet, and no hands. He emphasizes the necessity, when cups are used, of removing them every few minutes and shifting them slightly. They must be adjusted carefully so that their sucking action is neither too strong nor too light. Neither probing nor curetting must be done. The treatment is not to be entrusted to a nurse. It must be individualized.

Says that the joints with the richest blood supply give the best results.

CARL DEUTSCHLÄNDER. Münch. med. Woch., 1907, p. 721.

"Die Hyperæmie is ein Sammelbegriff für mechanische, physicalische, chemische und biologische Vorgänge der verschiedensten Art, deren Ursachen noc zum grössten Teil im Dunkeln liegen."

The writer praises the treatment highly and recounts a number of cases in which it has been successfully used. Only one joint in his forty-four cases came to a resection, a knee. One finger was disarticulated so as to make the treatment simpler! Two diaphyses of spinæ ventosæ were resected.

He emphasizes the importance of long continued treatment and lays down certain rules:

1. The hyperæmia must always be of short duration (one to two hours daily). 2. It must not be painful. 3. The treatment must be intermittent, that is, after several weeks it must be omitted for about a week. 4. The hyperæmia must be supplemented by Klapp's cupping method when fistulæ are present. 5. Treatment must be begun early and continued long after the symptoms have disappeared. 6. Infected abscesses must be slit up. 7. Cold abscesses must be punctured and then cupped by Klapp's method. 8. Immobilization is not necessary nor advisable. Light movements are advised. 9. The joint must be protected. — "Entlastung."

The author considers the Bier treatment the best conservative treatment in our possession.

BUM. Die Behandlung von Gelenkerkrankungen mittelst Stauung. Wiener med. Pr., 1905, Nos. 3 and 4.

Bum observes that joints distal to the joint being treated by hyperæmia are not subject to the usual stiffness.

HOFMANN. Veranderungen im Granulationsgewebe fistulöser fungöser Herde durch Hyperæmisierung mittelst Saugapparate. Münch. med. Woch., 1905, No. 39, p. 1864.

By microscopical examination of granulations from the walls of tuberculous joint fistulæ before and after cupping, Hofmann arrived at the conclusion that the treatment effected its results by a widening of the blood vessels and a washing of the tissues free of leucocytes.

HENLE. Beiträge zur klinischen Chirurgie, 1898, xx, 3, p. 803.

Henle gives the results of the conservative treatment of joint tuberculosis at the Breslau Klinik, and finds them much better than those with radical treatment. His percentage of recovery with "Stauung," however, is much below that with the injection of iodoform-glycerin (66.7 per cent and 82.5 per cent).

GEBELE UND EBERMAYER. Ueber Behandlung der Gelenktuberculose. Münch. med. Woch., 1906, No. 13.

The writers maintain that only those cases lend themselves to the Bier treatment, which become rapidly blue-red and painless. Cases with fistulæ are more suitable than those without them. They apply the bandage four to six hours daily and combine the treatment with fixation.

KLAPP. Mobilisierung versteifter und Streckung Contraktuierter Gelenke durch Saugapparate. Münch. med. Woch., 1905, No. 17.

A discussion of the principles of some of the apparatus for treating contracted joints by the air pump and rarefied air.

KLAPP. Die Behandlung der chirurgischen Tuberculose mit dem Schröpfverfahren. Arch. f. klin. Chir., 1906, lxxx, 42.

The pauses customary in the application of cups to acute infections are not so important here. Cold abscesses are to be slit up asept cally and then cupped. Considers it a crime to open a cold abscess unless it be "hyperæmized;" if it be, then it never becomes infected. He never scrapes tuberculous granulations, and always

leaves the cups on for some time after the pus has ceased to run. This drains the tissues and helps to prevent infection. When the serum discharge that follows the purulent is examined, it is found to contain leucocytes, lymphoctyes, red blood corpuscles and bacteria, while the blood-vessels in the granulations are widened and free from leucocytes. From experiments on guinea-pigs the infectiousness of the abscess that has been cupped has been found to be very slight. The tuberculous skin ulcers found in the neighborhood of fistulæ can be prevented by cleaning the skin with benzine and then by covering it with salve before the cups are applied. Recently he has used his large cups (Saugglaser) with good effect, combining this with puncturing.

V. SCHMIEDEN. The treatment of Surgical Tuberculosis by Hyperæmia (Bier). Medical Record, lxxii, No. 7.

Says the joint must not be left in fixation, but recommends rest in bed for severe tuberculosis of the leg, protecting the joint by mechanical apparatus. The joint must be movable after the disease has healed. He excepts from this the knee on account of its "complicated construction." Milder cases are to be treated by splints and by hyperæmia. The hip is not practicable to treat. Recommends opening cold abscesses and cupping them. Uses cups generally on sinuses.

E. v. FÉLEGHÁZI. Beiträge zur Erklärungs weise der Bierschen Stauung im Granulationsgewebe fistulöser fungöser Herde. Deut. Zeit. f. Chirurgie, xciii, p. 459.

From a series of microscopical examinations Félegházi finds that the beneficial results of Bier's treatment are not due to any bactericidal elements in the blood but to the abundant production of connective tissue. The good results of the Klapp cups upon the fistulæ are due to the sucking out of great numbers of bacteria.

W. KÜHNE. Die Anwendung der Bier-Klappschen Saugapparatezu orthopædischen Zwecken. Monatschr. f. Unfallheilkunde, xiv, p. 104.

Author uses the suction apparatus with great effect in limbering up stiff joints. He has improved in comparatively short time joints that have long been stiff.

KRAUSE. Deut. Chir., Lief 28 a, p. 221.

A combination of Bier's treatment and iodoform injections is recommended.

HABS. Münch. med. Woch., 1903, No. 22, p. 938.

In an unusually scientific and valuable article the author gives his experience in about 200 cases of local tuberculosis. On the whole, he regards the treatment as useful. He obtained excellent results in many cases, especially in cases of "closed" tuberculosis, that is, cases without sinuses; but on the other hand many cases needed final operation. He suggests a trial of the method in all cases, but warns against losing time by persisting in it if it does not better the disease. He does not forget that he has also had very good results from other conservative methods, and dwells upon the importance of constitutional treatment.

CHAPUT. Treatment of white swellings and tuberculous synovitis by Bier's method. Revue de Chirurgie, xxxix, 1909, p. 1229.

Chaput reports fourteen observations on tuberculous osteoarthritis and synovitis, in which Bier's method yielded excellent results. These cases include ten cases of tuberculosis of the wrist and tendon sheaths, two cases of tuberculosis of the elbow, and two cases of tuberculosis of the ankle. The majority of these patients suffered from severe forms of white swelling, some associated with fistulæ, or running a rapid course, apparently headed shortly for amputation. All these cases were promptly cured by Bier's method employed alone, without immobilization and without intra-articular injections.

Discussion. Pierre Delbet employed Bier's method a number of times, and his results were negative. He asks whether the excellent reported results actually concerned cases of tuberculosis. There is too much tendency to consider every chronic arthritis as of tuberculous character.

Aaron has utilized Bier's method for three years past, and has not reached a definite conclusion concerning it. But it seems to him that the results have been zero in closed tuberculosis; in tuberculosis with the formation of fistulæ, on the contrary, there are certainly noteworthy improvements, disappearance of pain, and of fever.

Routier applied Bier's method in two cases: one of these, a tuberculous arthritis of the knee, terminated disastrously, and amputation had to be performed; in the other, a tuberculous arthritis of the elbow, the result was zero.

DUPONT, ROBERT. Quelques résultats de la méthode de Bier. Revue de Chirurgie, xxxix, 1909.

The author reports his observations on a number of patients treated with Bier's method, according to the technique employed in Bonn, and learned from Bier in person on the occasion of two visits, in September, 1905, and in February, 1906. With special reference to surgical tuberculosis, both adults and children were submitted to the treatment, which was never insisted upon, but always stopped in those cases where it seemed to be obviously useless or even injurious. The children were treated with Bier's method, in the Hôpital des Enfants-Malades, during the author's service as an interne under Prof. Broca and included two cases of tuberculosis of the elbow, four cases of spina ventosa, one case of tuberculosis of the first right metatarsal, two cases of tibiotarsal tuberculosis, one case of tuberculosis of the knee. Among adult patients the method was employed in only four instances.

From these fourteen observations, it appears that Bier's method yields only mediocre and uncertain results in surgical tuberculosis.

In the beginning tuberculoses, the most certain result seems to be the appearance of an abscess, as was noted in two instances by the author. In one case, the results of such an abscess were disastrous, the patient, a man forty-nine years of age, dying from general miliary tuberculosis.

In a case of white swelling of the left knee in a man forty-five years of age, the fungosities diminished and a fluctuating surface on the calf underwent a sclerotic change instead of breaking down. This was one of the most favorable results, but the patient could not be followed up, and it is a noteworthy fact that he was not out of bed during his entire sojourn in the hospital.

To summarize, it would seem that if the employment of Bier's band is harmless and possibly of some use in open tuberculosis, it is dangerous in closed tuberculosis. There is one condition, however, under which Bier's method may be employed even in a closed tuberculosis, namely, in the presence of a painful tuberculosis.

DEBREZ. Observations cliniques sur les méthodes de Bier. Arch. Provinciales de Chirurgie, 1909, janvier, No. 1.

The author contributes his results with Bier's method in the clinics of Prof. von Winiwarter in the University of Liege (Belgium). He points out that French literature contains but few articles on this subject and promises another communication which is to deal with tuberculous and bony affections. The present paper includes neither tuberculosis nor bone disease.

GEBELE. Ueber die Behandlung mittels Hyperæmie nach Bier. Münch. med. Woch., 1908, Nos. 3 and 4.

The experiences in the Munich surgical clinic as regards the hyperæmia treatment in tuberculosis of bones and joints were not favorable in a general way. Hot and cold abscesses very frequently appeared after a temporary improvement, the former in open, the latter in closed tuberculosis. Among eleven cases of tuberculosis of the knee joint, only two healed. Of six cases of tuberculosis of the foot and ankle joint, none healed. Results were more favorable in tuberculosis of the elbow, wrist, and shoulder joint, but only a part of the cases terminated in a cure. In a general way, the impression was obtained that tuberculosis of the soft parts, especially open cases, reacted better to the congestion than did bone tuberculosis and closed cases. The outcome of the congestion treatment was much more favorable in acute inflammatory processes. Especially in tendon sheath and bone panaritia, the results were better than those reported in 1906 by Bestelmeyer from the same clinics. The author claims that in open tuberculosis a large part of the result is mechanical.

BENNETT, W. Induced Hyperæmia as a Means of Treatment, with Special Reference to Tuberculous Joint Disease and Stiffened Joints. British Medical Journal, Nov. 21, 1909.

Hyperemia is utilized by the author chiefly as a diagnostic measure, in the initial stages of joint tuberculosis, when it is difficult to distinguish this condition from a simple chronic inflammation. The latter is promptly and positively influenced by hyperæmia, whereas this is not the case in incipient tuberculosis, according to his experience. Its usefulness begins only in the presence of stiffening suppuration or fistulæ, when it acts in the sense of accelerating the purulent process, and of controlling an existing mixed infection. Hyperæmia is an excellent remedy for stiffened joints, from both the prophylactic and the curative points of view.

WATERHOUSE. An address on Prof. Bier's Treatment by Means of Induced Hyperæmia. British Medical Journal, July 18, 1908.

The hyperæmia treatment has been employed by the author for the last twelve years, and he declares its results in articular tuberculosis to be superior to all other methods. He invariably combines injections of iodoform with the congestion bandage, however, so that his results can not be referred to the congestion alone. The advantages of the method are pointed out by him in twenty illustrative cases, taken from a large number of observations.

GEEKOFF. Congestive Hyperæmia as a Curative Factor. Russian Archives of Surgery, vi, 1908.

The author cautions against the employment of congestive hyperæmia in weakened individuals, whose general condition has been disturbed by chronic processes. In such cases, the chronic suppurations and necrobioses, etc., are said to be affected in a very unfavorable manner by congestion. In a general way, however, notwithstanding his limited material, the author has been led to form a good opinion of hyperæmia as an adjuvant in the treatment of surgical affections.

ASSNY, PAUL. Ueber Behandlung mit Hyperæmie nach Bier. Arch. f. klin. Chir., lxxxviii, 1908–9.

Acute inflammations and surgical tuberculosis form an extremely large contigent of the cases coming under the observation of the author, who is connected with the German Consulate in Chung King, Western China. There was accordingly abundant opportunity for testing the effects of the hyperæmia treatment. It is very striking that a decided improvement follows in many cases after a few sessions (congestion combined with suction), in open joint tuberculosis with fistulæ and severe secondary infections. The joint becomes painless, the swelling and redness subside. The fever which is usually present disappears; the appetite improves, and the general condition of the patient is often improved in a very remarkable manner. Patient and physician become imbued with a most hopeful spirit as to a prompt recovery. Almost invariably, however, there ensues a very considerable retardation of the progress at the end of two or three weeks. After the treatment has been continued for many months a fistula will occasionally close, and the joint in favorable cases may become painlessly movable, and perhaps even conditionally useful.

Summary of results with hyperæmia treatment. Hyperæmia is capable of exerting a favorable influence upon tuberculous affections of the bones, joints, and soft parts, which may heal with sufficient perseverance on the part of patient and physician, preventing a mutilating operation. The rapid initial results in cases of joint and bone tuberculosis, and in tuberculosis of the soft parts, often with small fistulæ, are based upon the removal of the secondary infection and its sequelæ.

PANZACCHI, G. L'edemizzazione e la stase alla Bier in ortopedia. Atti del II Congresso della Soc. Ortoped. Ital., 1907.

The congestion method of Bier was employed by the author in a number of cases of bone and joint tuberculosis. He applied his treatment at two different periods: either in the florid stage of tuberculosis, when it served to attenuate the process; or in the stage of repair, which was rendered less adherent, diminishing the tendency towards fixation. In a few cases of tuberculous arthritis of the knee joint, especially of the synovial type, he was enabled to obtain a cure with a functional outcome of fair mobility. Noteworthy improvement was likewise obtained in tuberculosis of the bones of the foot.

SEE ALSO

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A CONTRIBUTION TO THE HISTORY AND TECHNIQUE OF EXTRAPERITONEAL CÆSAREAN SECTION

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WHEN Veit of Halle, in order to render Cæsarean section reasonably safe, i. e., as safe as an ordinary laparotomy, sends a patient with a contracted pelvis to his clinic, two to three weeks before labor, allows only occasional vaginal examinations with sterilized hands, and, if all these requirements cannot be met, advocates a limitation of this method of surgical intervention to those cases only where there is absolutely no alternative, or, as he expresses it, "a limitation to the utmost," he may seem to under-rate the capabilities of modern surgery and to magnify the dangers involved in Cæsarean section.

Statistics of Cæsarean section of the last five to ten years are so encouraging, that most operators approach this operation with less hesitation than formerly, and the very limited field of indication, in consequence, has of late been considerably widened. Still these favorable reports are deceptive, as they do not present the true state of affairs. True it is the mortality in clinics has been lowered to from 3 to 5 per cent. If, however, we collate all cases reported to the various health offices throughout the land, the reporting of which has been compulsory in certain countries, the mortality rate of Cæsarean section suddenly rises to stupendous heights, to 25 and 35 per cent, a rate higher than that of the worst epidemic of Asiatic cholera. The laity, therefore, is still justified in its traditional fear of this operation, the very word "Cæsarean section" having been considered equivalent to a death sentence.

That the profession during the last decades was fully alive to the shortcomings and imperfections of this operation is clearly demonstrated by the attempts to find methods of evading Cæsarean section. Symphysiotomy and hebosteotomy appeared, operations involving the wounding of soft parts including bone tissue in a surgically highly unfavorable location because of its great liability to infection, to hæmorrhage and to wounding the bladder, whereas Cæsarean section may be done in the most favorable and easily accessible location, without great danger of hæmorrhage, and in case it does occur, with the possibility of easy control, and at the same time insuring greater safety to the child.

To a careful observer it seemed that obstetricians loved Cæsarean section, its nicety and accuracy, that they all agreed on the fact that it is the most scientific and, if successful, the most satisfactory and gratifying to both patient and physician, but that this love was merely platonic; the average operator, if suddenly confronted with a case of absolute indication for some sort of surgical intervention to relieve the mother, would much rather resort to hebosteotomy, craniotomy, or morcellment, sacrificing the life of the child. Thus Frank of Cologne, in his first publication on extraperitoneal Cæsarean section says: The fact that all operations for the increase of pelvic diameters were welcomed so enthusiastically by the profession is a priori sufficient proof that our present methods of Cæsarean section are unreliable and do not reach the high standard of present day surgery.

From time immemorial the principal danger of classical Cæsarean section was infection, a danger by no means set aside when Weichselbaum commenced to teach his students the first principles of asepsis in the lying-in chamber and Lister's discoveries opened the way for almost absolute safety in intraperitoneal operations. The deadly peritonitis following Cæsarean section comes, as we all know, from within, from a contamination of the peritoneal cavity with the highly infectious lochia during operation or through leakage from the uterine wound post operationem. This was also known to older surgeons, for they noticed that often healing of the uterine wound was not by primary intention. Therefore, some even recommended not to suture the uterus lest this might retard contraction and involution, and Porro in 1877 advised removal of the entire uterus.

Even Saenger's rehabilitation of Cæsarean section in 1882, which, by its removal of almost all possibility of post-operative leakage, not only superseded Porro's operation, but also all suggestions aiming at finding a way into the uterus without invading the peritoneal cavity, was not sufficiently reliable to meet the exactions the present age is justified in making. In spite of a most careful sero-muscular suture general peritonitis often sets in on the third or fourth day due to sloughing of the uterine wound. The lifting out of the pregnant uterus from the abdomen not only contuses the tissues and may cause respiratory effort on the part of the fœtus, but also may be conducive to severe shock to the patient, not speaking of the increased liability to hæmorrhage from passive congestion of womb incident to its constriction by the abdominal wound, the danger of visceral adhesions and of hernia. This led Frank to take the initiative in reviving the almost forgotten operation of extraperitoneal invasion of the uterus, the history of which I will briefly sketch.

Il n'y a de nouveau, que ce qui est oublié, où ce qui a vieilli — there is nothing new under the sun. It is a curious fact, that often works of general usefulness are completely forgotten until rediscovered by accident or after necessity has prompted a search for such works.

When Ambroise Parè, in 1549, recommended podalic version he only repeated an operation practiced one thousand years before by Amida and which had fallen into oblivion by the fact that Paul of Aegina omitted to describe it in his text-book. When Mayor of Geneva, in 1818, and Lejumeau de Kergaradec in 1821 directed the attention of the profession to the auscultation of the fœtal heart-sounds they rediscovered a phenomenon which seemingly Phillip le Goust had taken note of two hundred years previously, as he in his "Humani foetus historia" compares the rhythm of the fœtal heart-sound to the clatter of a wind-mill. (v. Winkel, l, 1). More recently Morisani again brought to light the operation of symphysiotomy proposed and performed by Sigault a century and a half ago. Thus Frank only rehabilitated a method the idea of which had suggested itself to Joerg a hundred years before.

Joerg of Leipzig, having seen in the clinic of his teacher, Boër, that ruptures of the vagina were less dangerous than ruptures of the uterus, in 1806 recommended a method of Cæsarean section in which the vagina instead of the fundus uteri is incised. His operation is described in his "Systematisches Handbuch der Geburtshilfe." Unfortunately his original report could not be found. Although Joerg avoided the highly vascular uterus, probably regarding hæmorrhage as the principal danger, he still opened the peritoneal cavity by the ordinary, the Deleurye, incision in the linea alba. His idea of low internal operation, however, suggested to Ritgen of Giesen the suprapubic incision and invasion of the uterus through the cavum Retii. Thus in Ritgen the idea of approaching the pregnant womb extraperitoneally in Cæsarean section really finds it genesis. As this investigator's report may be of great interest just at present and not easily accessible I append his description of his operation as it appeared in 1825 in the "Heidelberger Klinische Annalen":

1. The obstetrician standing on the right side of the patient introduces a male catheter into the bladder with which this organ is pulled and held to the left side by an assistant. Another assistant draws the uterus toward the left thus putting the skin of the right side on a stretch. 2. A curved incision from the crest of the ileum down to the symphysis pubis

through skin and muscles to the peritoneum is made. 3. The subperitoneal cellular tissue now is bluntly dissected with fingers, and if necessary with instruments until one reaches the lateral wall of the vagina. 4. Now a pointed sound, "Pfeil sonde," is passed into the vagina and its wall lifted toward the operator, while the womb is firmly drawn to the opposite side, thereby crowding the vagina into the incision. 5. The sharp sound now is forced through the vaginal wall and from the puncture an antero-posterior incision is made with a bistoury. 6. The flap of the vaginal wall attached to the right side of the cervix is now split up to the cervix. 7. The wound is covered with a soft piece of cloth saturated with oil and spontaneous delivery is awaited, being aided by drawing the womb to the left side. If necessary the cervix may be incised. 8. After delivery of child the wound is cleaned and muscle and skin are sutured. The vaginal wound is left to take care of itself.

In October, 1821, an opportunity to apply his method presented itself to Ritgen. The patient had osteo-malacia, and her pelvis was deformed so much that the head bulged out above the receding pubis, which condition suggested to the attending physician that Ritgen's operation might be of benefit. Ritgen operated the patient under opium in her home. He was able to carry out his plans to perfection, expose the vaginal wall without especial difficulty or hæmorrhage, and deliver a living robust child. The faint the patient had fallen into from the ordeal yielded to stimulation and she rested well. The over enthusiastic attending physician now insisted on the employment of the manifold remedial agents ("polypragmatische ordinationen") of that age, among them hot poultices over the abdomen, for which reason Ritgen withdrew from the case because of the increased liability to hæmorrhage this treatment would produce. The patient gradually failed and died after sixty hours, presumably from hæmorrhage. The post-mortem findings revealed enormous clots in wound and uterus, un-united wounds, but no pus. Although obstetricians and operators of that time might have regarded death as due to wrong after treatment rather than operation Ritgen's method seemed to sink into its grave with the unfortunate patient.

About this time, in 1825, we read in Dr. Dewees' Compendious System of Midwifery, of a similar method of extraperitoneal Cæsarean section planned and executed by an American physician, Physsics by name. Horner, a friend of Physsics, mentioned this in a letter to Dewees. According to Horner, Physsics, a most skillful surgeon, made a cross incision directly above the pubis bluntly dissected through the submuscular cellular tissue and then dissected the peritoneum off the moderately filled bladder. After thus exposing the cervix he incised it transversely through which opening the fœtus is delivered.

Physsics' method differed from Ritgen's in external incision and in opening the parturient canal. Ritgen opened the vagina, Physsics, the cervix and followed the more difficult median route. Two things characterizing our most modern methods of extraperitoneal Cæsarean section here are met with for the first time: moderate filling of bladder to produce a topographical guide and opening of cervix. Physsics' operation was not favorably received by the profession until fifty years later when Thomas took it up and applied it with success.

About the year 1825 it seemed as if all minds of surgeons were bent on finding an extraperitoneal method of Cæsarean section, since not only in Germany and America we find investigators presumably independent of each other, follow the same plans but also see Baudelocque in France making experiments and investigations with the same object in view.

In the year 1823 Baudelocque, le neveu, recommended two ways of approaching the vagina, one, like Ritgen, by laterally entering and dissecting up the peritoneum from the iliac fossa, the other, like Joerg, by opening the vagina transperitoneally. He tried his method, the technique of which he had previously tried on the cadaver, on two cases both terminating fatally, one by hæmorrhage, the other by septic peritonitis. Baudelocque was so discouraged by his failure, that he not only abandoned his method but later even published an article ridiculing his method. (Operation Cesarienne, elytrotomie, ou sec-

tion au vagin précédè, ou non, de la ligature, ou de la compression de l 'artère iliaque interne.)

Although Baudelocque and with him the French medical fraternity were opposed to this new operation, Caruso in the Arch. di Ost. e Gyn., 1884, says that Testa of Naples in 1858 had interested himself in Baudelocque's work and had published a modification of Baudelocque's method, uniting the lateral incision with a median one in order to get a larger opening. In spite of this, however, the bladder was mistaken for the vagina and opened twice. After finding and opening the vagina a living child was extracted, but the patient died shortly thereafter.

Thus far all operators from Joerg to Testa had fatal results. Of Physsics' results apparently nothing is recorded. It remained for Dr. Theodore Gaillard Thomas, Professor of Obst. and Gyn. at the College of Physicians and Surgeons, New York, again to bring to light, to perfect and first successfully to perform this operation. In the year 1870 Thomas published an article in the American Journal of Obstetrics in which he expresses his belief in the feasibility of extraperitoneal Cæsarean section and its superiority over the old method. He furthermore states that he had made dissections and anatomical studies of the parts involved in this operation long before he had heard of Joerg's and Ritgen's work in that line. Although all operations by this method had so far terminated fatally he thought this due to faulty technique and other unfavorable circumstances rather than to shortcomings of the method.

The first opportunity he had to perform his operation was on a full-term gravida, who had died of eclampsia. He describes the operation in substance as follows: After dilating the cervix with the hand, he made an incision from the symphysis pubis to the right anterior-superior spine of the ileum down to the peritoneum, which latter he could easily separate and push upward, so that with a few sweeps of the fingers he had the vagina and cervix exposed. Then he cut through vaginal wall using as guide a sound introduced into the vagina and held by an assistant. The opening was quickly enlarged by cutting and stretching and the cervix was drawn through it into the external wound by means of a blunt hook. The fœtus thereupon was easily extracted.

The ease and expedition with which the cervix could be reached by this route encouraged Thomas to make further attempts in that direction, so when called upon to save, if possible, the life of a child in a moribund patient, he again used his extraperitoneal method and found it equally practical. The child being premature and in all probability poisoned by the pneumonic toxins of the mother died shortly before the patient an hour later.

It was obvious that the operation was in no causative relation to the death of either mother or child, and Thomas thought this method a justifiable procedure when called to make a Cæsarean section to save mother and child.

The patient was a primipara of 20 years, a cripple of dwarf growth, one leg, distorted by contractures, was fairly drawn up over abdomen, her conjugata vera 2½ inches, and fœtus in breech presentation. Having exposed and opened vagina according to described method a pain brought the fœtus through the incision into the iliac fossa and extraction was very easy. The operation lasted thirty-five minutes, mother and child lived. The bladder had been wounded somewhere but the fistula healed very quickly.

Long before Thomas had an opportunity to apply his method himself on the living subject he had interested his friend, Dr. A. J. G. Skene, in his operation. In his article, published in 1876, Skene reports two successful cases. In both cases he wounded the bladder, but says it was due to faulty technique and could be avoided. In both cases mother and child survived the operation.

In the year 1878 the Am. Gyn. Society in session in Philadelphia discussed the question of gastroelytrotomy, as extraperitoneal Cæsarean section had been designated (*τὸ ἔλυτρογν*, the vagina). Garrigues of Brooklyn read a paper on this subject. After a historical introduction he recommended, in describing the technique of the operation, opening the vagina with the thermocautery to avoid hæmorrhage, this having caused the failures of Ritgen and Baudelocque. He regarded the method as

most promising and deemed its technical difficulties hardly greater than those of herniotomy or ovariotomy. He proposed the employment of gastroelytrotomy in place of craniotomy or embryotomy in cases with a conjugata of 2½ inches or less.

Barker, Thomas, Byford, Campbell, and Bozemann discussed the paper. Dr. Byford said he was highly in favor of the operation and that he now was convinced that the danger of hæmorrhage was not as great as he had thought. Dr. Bozemann thought it was impossible to open the vagina without injuring the ureter and that the cases of supposed wounding of the bladder really were injuries to the ureter. Garrigues, who regarded Bozemann's apprehensions with regard to the ureter as justifiable, later made a careful study of the anatomical relations of ureter with actual measurements on the cadaver of the distances of ureter from uterus and cervix.

An additional report of a successful case appeared in the American Journal of Obstetrics, 1880, by Gillette, who performed gastroelytrotomy on a crippled primipara with a conjugata of 1½ inches. The child had been dead for some time and was delivered with a cranioclast. The bladder was not wounded, and the patient made an uninterrupted recovery.

Meanwhile English surgeons had given the extraperitoneal method of Cæsarean section a trial, and two cases appeared in the literature, one in the Lancet, reported by Dr. Whiteside Hime, the other in the British Medical Journal by Dr. Edis. Hime delivered a living child by gastroelytrotomy, the viæ naturales having been almost entirely occluded by carcinoma. The operation lasted twenty minutes. The patient died two hours later of exhaustion. Edis delivered a living child from a woman who died forty hours after the operation. The bladder had been wounded, but the peritoneal cavity was intact, and there was no sign of peritonitis. The vaginal cut in this case was made on a line parallel with the linea ileopectinea.

From the available literature I was able to collect eight cases of extraperitoneal Cæsarean section reported up to 1880. Thomas had two, Skene, three, Gillette, Hime, and Edis each one. The bladder was wounded in six cases. The mortality rate of the mothers reached 50 per cent, of the children 42 per cent. If we ascertain from the histories of the cases which deaths might have been directly or indirectly attributable to the operation, the operation-mortality falls, I would say, to almost nil.

Additional cases were collected by Duncan and Clark, two of Skene, one of Dunkan, and two of Jewett. I regret to state that I was unable to find the literature either in Germany or Austria, having made inquiries through the Berlin Bureau of Library Information. The mortality rate of these cases is also given as 50 per cent in the abstract.

In spite of the advantages of extraperitoneal Cæsarean section the profession in general did not regard it with favor. The close proximity of the bladder and the ureters, the danger of hæmorrhage and the difficulty of technique induced the operator of average skill and knowledge of anatomy sooner to take his chances with the more familiar method. Besides Kilian's words in his "Operative Geburtshilfe," Bonn, 1849, that gastroelytrotomy is an invention based on the mistaken notion that the invasion of the peritoneal cavity constituted the principal danger in classical Cæsarean section, may have had some bearing in shaping the opinion of many obstetricians with regard to the Ritgen and Thomas method. Above all, with the advent of aseptic surgery, came Saenger's epoch-making improvement of classical Cæsarean section. Little wonder, therefore, that even Thomas, like Baudelocque fifty years before, abandoned his gastroelytrotomy and used the Saenger sero-muscular suture in connection with intraperitoneal Cæsarean section.

If we look through the older text-books, as that of Busch, Siebold, Spaeth, Naegele, and Spiegelberg, we find that gastroelytrotomy is mentioned only as a method not to be recommended. In later text-books it is omitted entirely. Saenger and Winkel denounce it as dangerous to mother and child. On the other hand, says Schroeder in his "Lehrbuch der Geburtshilfe," 1884: "The future of elytrotomy, at present, may not be foretold, at any rate this operation first recommended by Joerg and Ritgen and perfected and successfully performed by Thomas, is worthy of notice."

I stated above why it was that modern, progressive surgeons, in spite of the fact that they had at their command an array of surgical procedures with which they could meet, one would think, almost every indication, endeavored to find still another method for the relief of birth impossible pervias naturales. Frank of Cologne deserves the credit of having redeemed from oblivion the work Thomas abandoned as impracticable.

In 1881 Frank had tried to exclude the general peritoneal cavity from the field of operation by means of a "tent" (Zelt) formed by suturing the round ligaments to the abdominal parietes and making the uterine incision low down. This operation, however, Ehrendoerffer, Saenger, and later Frank himself, believed too complicated to be generally useful. In 1907 Frank proposed a method "by means of which one may absolutely shut off or perhaps not open at all the peritoneal cavity before incising the uterus, in order to produce, as it were, artificially, a rupture of the womb outside of the peritoneal cavity." In his article published in the "Archiv. für Gynæcologie," 1907, volume 81, Frank formulates the advantages of his method as follows: 1. It avoids hæmorrhage. 2. It avoids peritonitis. 3. It increases the range of indication, i. e., patient and physician may defer extraperitoneal operation to a time when classical Cæsarean section would be contraindicated on account of exhaustion and infection.

As to technique of operation, Frank makes a cross-incision directly above pubis, cutting muscles a little higher up to leave stump for muscular suture. The external inferior epigastric is ligated and cut. After opening the peritoneal cavity the plica vesico-uterina is cut near the bladder, dissected up from the uterus and securely sutured to parietal peritoneum. Now the uterus is incised transversely and the fœtus should, if possible, be allowed to be delivered spontaneously through this channel. He states that it would be a difficult and delicate task to attempt dissection of the peritoneum from bladder, it would cause a good deal of bleeding from bladder-wall and very likely bruise and button-hole peritoneum. In rare cases the bladder is wholly disconnected from peritoneum and can easily be retracted to expose cervix. As the anatomy of this region during pregnancy has not been sufficiently studied, especially in regard to plica, he thinks it best to open the cavity and work in a clear field. After delivery the lower edge of uterine wound would sink deeply into pelvis if not secured by a tension suture. The placenta is delivered by Credè. The uterine wound is sewed up with catgut in clean cases and left open for an iodoform gauze abdominal drain in infected cases. Also an iodoform gauze drain is passed from uterus through vagina.

In his article Frank reports thirteen cases operated by his method with no death, although in only one case of the thirteen, in his opinion, classical Cæsarean section would have been indicated according to the sharply defined limitations of indication of Veit and other authorities.

Fromme, of Veit's clinic in Halle, was the first operator to adopt Frank's method. Although his first case, an infected primipara with a conjugata of 6½ cm., was highly successful with regard to mother and child, he found that several features of this operation were not according to his liking, so in his subsequent cases he modified Frank's method in several ways: he reunited the edges of the divided plica, thinking that altered peritoneal conditions might be harmful to patient; he made a vertical incision in abdomen and uterus instead of Frank's cross cut; and he closed the abdominal wound in every case when necessary, draining through vagina.

Veit and Fromme think the good results from this operation would warrant its use in many infected cases, in which, at present, pubiotomy is regarded the safer procedure, and furthermore recommended that it should be used in all primipara in place of hebosteotomy, as this operation involves extensive laceration of the narrow soft parts of a primipara.

Reading Frank's article one gets the impression that he regards a strictly extraperitoneal operation, as performed by Thomas and Skene, as ideal Cæsarean section if the danger of wounding the bladder could be eliminated. He also says that careful topographical investigation of that region would

perhaps show a way to operate extraperitoneally.

Sellheim accordingly took up the study of the hypogastric region and the changes of the plica during pregnancy. He found that the age and general bodily conditions and development of the individual influence the extraperitoneal length of the cervix; that the enlargement of uterus and cervix raises the utero-vesicle fold and bladder and that the fold is almost effaced late in pregnancy; that during labor, when the body of the uterus retracts and the cervix expands and is stretched in the line of its axis ("Axen Dehnung"), the cervix is denuded of its peritoneal covering and the plica barely touches the tip of the bladder. This anatomical state of affairs may readily be seen on the frozen sagittal section of a gravida in labor, as for instance, on Baumm's.

Encouraged by his observations Sellheim regarded the median extraperitoneal operation as comparatively easy. In his first case he pursued the following plan: In high elevation of the pelvis the cavum Retii is entered by the Pfannenstiehl incision, which, as is known, preserves the muscular structures. The peritoneum now is dissected off the lower surface of the recti. The bladder having been loosely filled so its contour is easily recognized, its peritoneum is dissected off with gauze and by blunt and sharp dissection, as needed. In the median line scissors must be used. Then the bladder being retracted downward and the peritoneum upward, the cervix is freed from connective tissue and is opened by a vertical incision in the median line. The child is delivered by lifting from within the presenting part into the wound. The uterine wound is sutured with catgut.

Sellheim operated only one case according to the method outlined above. In his subsequent cases he approaches Frank more and more in technique, operating with slight modifications of Frank's method, transperitoneally. He even approaches Frank in regard to drainage of uterus through abdominal wound, differing only by establishing a fistulous opening by suturing first the parietal then the uterine peritoneum securely to skin.

Gynecologists and obstetricians everywhere now took up the matter and soon numerous reports appeared in the literature. The late Professor Pfannenstiehl opened the bladder while trying to dissect off its peritoneum and was obliged to operate transperitoneally. Baumm, Hofmeier, Klein, Freund, Rubeska, and Wiemer were obliged to open the peritoneum in order to expose the cervix. Kuestner, Bumm, and Czyzewicz were able to work their way into the prevesical space by the extraperitoneal route in a few cases, mostly, however, they used Frank's method or a modification thereof. Pfannenstiehl and Rubeska even advised to abandon the extraperitoneal method entirely in favor of a low intraperitoneal operation, i. e., Frank's method without walling off the general cavity, and to restrict the indication to clean cases only. This would mean a return to the old classical Cæsarean section with nothing but a modification of the external incision with the Pfannenstiehl incision.

In the light of the experiences of these skillful operators it is obvious that extraperitoneal Cæsarean section is in most cases a most difficult task. The operator is quasi between Scylla and Charybdis, if he tries to keep away from the bladder he opens the peritoneum and, per contra, if he keeps at a safe distance from the peritoneum he will surely wound the bladder.

The star of extraperitoneal Cæsarean section again was on the wane and it would, for the third time, have met the fate it did after Ritgen's and Thomas' efforts if Latzko of Vienna, and especially Professor A. Doederlein, of Munich, had not improved and perfected the technique of the original Thomas operation in such a manner as to satisfy all the postulates of an apparently ideal operation. This method, as Latzko describes it in the Wiener Kl. Wochenschr. 1908, page 737, is in substance as follows: The bladder is loosely filled with about 150 cc. of water, a median incision is made ending at the symphysis. Working down to the left side of bladder this organ is pushed back on cervix. A median sagittal incision is made in cervix through which child is delivered.

At once we notice that this is a return to Thomas' way of invading the genital tract

through the paravesical space, with the unessential difference that he opened the vagina instead of the cervix. It is hardly probable, however, that Thomas worked his way past the bulging cervix down to the vagina hidden and deep in the small pelvis, with the ureters in dangerous proximity. Professor Doederlein thinks, therefore, that Thomas did open the cervix mistaking it for vagina, a mistake most easily made during labor. This would remove the only difference between the Thomas method and that devised by Latzko and Doederlein. Before giving in detail the technique of Professor A. Doederlein's operation, who, independently of Latzko, had taken up, rehabilitated, and perfected Thomas' work, I will briefly sketch the topographical anatomy concerned in this operation.

The region we invade is the subserosum prævesicale, paravesicale, and præcervicale. After dividing the posterior sheath of recti muscles we find ourselves in the cavum Retii and its continuation laterally, the cavum paravesicale. Through the loose connective tissue we get to the bladder covered with the prævesical fascia. The cavum paravesicale is related above to peritoneum, below to fascia of pelvis, externally to the internal obturator muscle, internally to the prævesical space or cavum Retii. The peritoneum is firmly adherent only in the middle line and on the posterior wall of the bladder, in all parts it is easily loosened up. It is of especial value during labor that firmly adherent peritoneum begins as high up as above the os internum. The bladder, which during labor most frequently lies in abdomen, is very movable and in disconnection from womb. The ureter varies in anatomical position in full term gravidæ. As is well known, the ureters enter the small pelvis at the bifurcation of the common iliac crossing the external iliac a little below bifurcation. It is in almost every case readily visible through pelvic peritoneum as it dips down on side of small pelvis and then courses in lower part of ligamentum latum forward and slightly inward, resting solidly imbedded in pelvic cellular tissue on lateral wall of vagina. It crosses the uterine plane at the height of the internal os above the arteria uterina and about 1½ to 2 cm. away from uterus, and thence runs forward to base of bladder. The part of ureter which naturally concerns us most in extraperitoneal Cæsarean section is the part resting on the vagina. From the close proximity to cervix and the density of tissue linking the ureter to uterus one may easily imagine how both ureters in labor resting directly on cervix are pushed laterally and are drawn up with cervix when os dilates and head cannot enter pelvis. How high the ureter may be raised above pelvic inlet by dilatation of os could be seen in a case of extraperitoneal Cæsarean section where it appeared in field of operation as soon as the paravesical space had been opened. It ran almost parallel to Poupart's ligament and 2 to 3 cm. below it over expanded parturient canal. In all other cases it was invisible. Deep dissection to expose it to view was never made in order to avoid disturbing the easily infected paravesical tissues. Suffice it to say that the ureter rarely is so dangerously near so it must be dissected up and pushed aside, its nearness, however, should always be remembered. As to blood-vessels, there are none of importance to avoid excepting the large uterine veins. In the last case I saw veins as thick as a thumb as soon as paravesiculum had been exposed. They could, however, readily be pushed aside in clearing the cervix. After delivery they had disappeared, which shows that they were varicosities.

After these anatomical remarks Prof. Doederlein's technique may be more readily understood, it is in detail as follows: The bladder, having been loosely filled, and the patient placed in an exaggerated Trendelenburg position, an incision is made on right side running from symphysis to a point a little above right anterior-superior spine. The structures are cut, according to Pfannenstiel, with transverse splitting and loosening up of fascia and pushing and retracting toward the left side of the right rectus muscle. Careful ligation of all bleeders should be made before disturbing the paravesical space. Usually the contour of bladder may be seen now. By slight dissection with the fingers the bladder may be readily seen and its attachment to the plica vesico-uterina. The cervix or lower segment of uterus is now exposed by dissecting with

fingers the loose cellular tissue from behind pubic bone, as is done, however, less extensively, in hebosteotomy, and pushing aside of bladder and peritoneum with gauze and retracting it gently. This may be done in a few seconds, and a space on cervix as large as the palm of a hand is exposed. In the most prominent part presenting in the external wound a vertical incision is made and carefully enlarged with scissors. The incision should not be larger than to allow the application of forceps to the head. In breech cases, extraction by foot is to be done. The placenta is removed by Credè or manually; time should not be lost waiting for spontaneous delivery. The uterus is packed with iodoform gauze, the end of which being passed out through the vagina. The uterine wound is sewed up with a continuous catgut suture, the loose cellular tissue and bladder stitched over the uterine suture and the external wound closed as usual. If there is suspicion of infection it is well to drain through vagina. A gauze drain may be placed down to paravesical space, from abdominal incision and removed after eighteen hours.

Prof. Doederlein thus far operated ten cases according to this method, of which I witnessed five. All of the ten mothers and children survived the operation, although some cases were brought to the clinic in a very unfavorable condition for operation. In three cases the external wound to the fascia suppurated and had to be opened and drained. All excepting one patient were primipara, all but one had rhachitis. In one Cæsarean section was made because patient had to be delivered rapidly on account of eclampsia and vagina was closed by œdema, so hysterotomy could not be made. Patient had three more eclamptic attacks on the day of operation; no more thereafter. Presentations were: left occipito-anterior in nine cases, one left occipito-posterior. The pelves of the patients were mostly of the flat rhachitic type with conjugata vera, taken intra operationem, of from 6 to 8½ cm. The children weighed from 2,200 to 3,500 grams. Labor had lasted from 24 to 72 hours before operation was undertaken. A number of children were asphyxiated; in most cases, however, I think the long-continued narcosis was the cause. The children would breathe when born and then be in a stuperose condition, breathing only on stimulation. No operation lasted longer than 25 minutes; the patient was kept anæsthetized, however, a long time before operation in some cases.

Concerning the technique of the operation, it is needless to say that this varies somewhat in every case. It usually is unnecessary to dissect back eritoneum and bladder from cervix, occasionally, however, this must be done in order to expose cervix sufficiently for delivery of fœtus. In the five cases I saw the peritoneum and bladder just had to be pushed aside with a sponge and retracted. The most prominent part presenting in the wound usually is the antero-lateral aspect of cervix. The longer the woman was in labor and the narrower the pelvis, the easier the denudation of cervix and the less liability to hæmorrhage. The hæmorrhage was most insignificant in all cases. The reason for this is that the cervix unfolds and expands mainly at the expense of its anterior aspect, away from the entrance of the blood-vessels. Thanks to the kindness of Prof. Rueckert of the Munich anatomical institute, I was permitted to observe and study this state of affairs on the anatomical specimens of the gravid uterus. One could see the crowding together of blood-vessels behind and the comparative freedom of vessels in front.

The incision in the cervix should not be larger than to allow the application of forceps to the head. Forceps hurry delivery without danger to child, and delivery is possible through a much smaller opening than would be required for manual extraction. The smallest and lightest forceps in one's instrumentarium should be used.

As to drainage. This is a most important question and still decidedly sub judice. von Rosthorn says a drain in this locality is a double-edged sword, it may drain in as well as out. In cases in which infection is probable, it would certainly be better to drain right away instead of being obliged to reopen the wound later. Our suppurative case was, as I said, from fascia only. It is a well known fact and recently again emphasized by Schauta that the much favored Pfannenstiel incision predisposes greatly to suppuration and should

not be used in infectious cases. Whether the Pfannenstiehl or vertical incision should be adopted in the average case, so to say, on the border line between infected and clean, further observation must teach. So much is certain, that Pfannenstiehl incision yields the best exposure of paravesical space. The position of patient on operating table varies with different operators, some use the horizontal, most operators prefer the Trendelenburg position.

As to range of indication of extraperitoneal Cæsarean section, authorities differ widely. Schauta thinks that extraperitoneal Cæsarean section was not given to the profession to replace classical Cæsarean section, but simply hebosteotomy. Although Prof. Doederlein would like to see the extraperitoneal method used in all cases where ordinary Cæsarean section is indicated, as also in some cases hebosteotomy and craniotomy otherwise would be resorted to, I believe that in absolutely clean cases classical Cæsarean section will hold its place as the operation par excellence, because it is beyond doubt the easier operation. There are, however, a great many doubtful or positively infected cases, cases in which craniotomy cannot be made because of the ardent desire of the parents for offspring or of religious scruples, or exaggerated contraction or distortion of pelvis, in such cases I would certainly prefer to take my chances with a possible abscess in the cavum paravesicale than a septic peritonitis.

Two further objections to this method are raised, and these are: inability to sterilize patient, and danger of rupture of uterus in scar in later pregnancies.

As to sterilization. I think it is a question of secondary importance at a time when the patient's life may depend on the selection of this or that method. Very often sterilization is not desired. The abandoning of the Porro operation was partly due to the sterilization it involved.

As to possible rupture of the uterus in later pregnancies, it is useless to speculate at the present time, the future will teach us. Rupture of uterus in scar of classical Cæsarean section occurred repeatedly with fatal result, of course. Whether a rupture into the paravesical space would be absolutely fatal, I would doubt.

A few words as to nomenclature. The old word gastroelytrotomy implies opening of vagina and, therefore, cannot properly be used. Hofmeier recommends that the term Cæsarean section should, by right of tradition, be reserved for all operations for delivery of fœtus above pelvis. The term vaginal Cæsarean section, as Duerssen called his obstetrical operation on cervix, should not be used, as it confuses the student; often the peritoneal cavity is not even opened during this operation. Bumm proposes the name of hysterotomia vaginalis for this operation. To distinguish between the method of Cæsarean section we have the adjectives intra-, trans-, and extraperitoneal.

As I pointed out above, Theodore Gaillard Thomas deserves the credit not only of careful experimentation with this operation but of first applying it with success clinically. He is the originator of the idea of invasion of the uterus through the paravesical space, which at present is the method of Doederlein and Latzko. Since we have the custom of designating certain methods of operation by the names of their originators, as e. g., the Wertheim operation, the Alexander-Adams operation, etc., it would be logical and doing justice to Dr. Thomas to call extraperitoneal Cæsarean section the Thomas operation.

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DEPARTMENT OF TECHNIQUE

THE TREATMENT OF ABORTION[1]

WITH A BRIEF REPORT OF 750 CASES OCCURRING IN THE OUT-DOOR DEPARTMENT OF THE CHICAGO LYING-IN HOSPITAL

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Abortion is unfortunately a common termination of uterogestation. While statistics are oftentimes unreliable in furnishing accurate deductions regarding its frequency, it is probable that abortion occurs once in every six or seven pregnancies. A large number of cases of retarded menstruation followed by profuse hæmorrhage are undoubtedly instances of early abortion. These cases, as a rule, do not come under medical care. While the diagnosis of abortion may be difficult, the interests of the patient are best served when the condition is treated as acute abortion. The predisposition to get up immediately after the ovum is lost or not to go to bed at all is prone to interfere with proper involution of the uterus and to lay up for the future a potent pathology.

The treatment of abortion is a matter of general and peculiar interest because these patients usually fall to the care of the general practitioner, and further, because of the opportunity afforded him to protect his patients from the future malign effects of this unfortunate accident. The disastrous results following streptococcic infection in abortion are almost too well known to mention, yet the fact that sepsis following abortion is on the increase emphasizes the importance of calling the attention of the profession repeatedly to this point.

In order to study the treatment of abortion, it is necessary to divide the subject into groups in which certain conditions are present and certain indications are to be fulfilled. The proper grouping of these cases is wholly dependent upon a correct diagnosis and this is obtained by a careful physical examination. The findings are studied in connection with the clinical history when the abortion is not criminal in character.

THREATENED ABORTION

A diagnosis of threatened abortion depends primarily upon a diagnosis of pregnancy, a difficult matter in the early months before definite signs are demonstrable. If the existence of gestation is dubious, every woman in the childbearing period who suffers from uterine hæmorrhage and intermittent pelvic pain should be treated for abortion. The patient usually gives a history of hæmorrhage for a number of hours or days. The blood comes from a slight separation of the decidua from the lower uterine wall. It may come in spurts or as a slight oozing. In the latter case, the discharge is brown in color. This oozing may continue for weeks — stillicidium sanguinis — and its effects upon the patient may be such as to produce marked anæmia. The patient complains of certain subjective symptoms such as pain in the sacrum and lower abdomen, pressure on the bladder, and slight tenesmus. In addition to the hæmorrhage, internal examination shows that the lower uterine segment is contracting. The internal os is closed or slightly dilated. The thickening of the fundus anteroposteriorly shows that the ovum is attached high up in its normal position. The lower uterine segment is undilated.

If, under proper treatment, the contractions are arrested and the bleeding stops, the pregnancy continues to develop if the ovum is alive. In other cases the condition may be relieved for a time. Later, the bleeding recurs and the ovum is forced out of the fundus and the abortion becomes inevitable. Less frequently, the ovum dies but is not expelled until weeks or months later as a blood mole.

The chief points in the treatment are rest in bed, the administration of drugs having a sedative action on the uterine contractions, and the avoidance of all local irritation. All the authorities are agreed upon the treatment of threatened abortion. Absolute rest in bed should be secured at once and is to be maintained as long as the bleeding continues or until the abortion becomes inevitable.

[1] Read before the Douglas Park Branch of the Chicago Medical Society, November 2, 1909.

If the hæmorrhage ceases, the woman may leave her bed cautiously, and upon a recurrence of the bleeding, she should return to her bed. Opiates, either as morphine or codeine, are preferred to arrest uterine contractions when they are painful to the patient. If they are not painful, or if they are relieved by opium, viburnum prunifolium is a valuable adjuvant. The bowels should be relieved by mild cathartics, preferably magnesium sulphate. Lange recommends that the patient lie on her side and claims that when lying on the back, the exit of blood from the uterus is favored. The side position favors the formation of clots and tends to prevent hæmorrhage. Both hot and ice cold drinks are to be avoided and ice packs over the lower abdomen frequently result in hastening the abortion.

It is important to know for how long a time our efforts to save the pregnancy may be continued. Theoretically, we should persist in the expectant treatment as long as the ovum is alive and the bleeding is not detrimental to the mother's health. When the ovum is dead it should be removed from the uterus. Practically, we are compelled to judge of the vitality of the ovum in the early weeks of gestation by the associated signs, namely, the amount and character of the uterine discharges, the contractions and changes in size and contour of the organ. If the patient passes a number of large blood clots, if the hæmorrhage is profuse, if the uterine contractions are not controlled by opiates, we may consider the case as one of abortion in progress.

In such a case, an internal examination reveals a relatively soft and dilated lower uterine segment. The internal os is more or less dilated and the finger is often able to palpate the lower pole of the ovum. In the primiparous woman, the upper cervical canal is dilated and may contain a portion of the separated decidua or the entire ovum itself, depending upon the progress of the abortion. The fundus has a distinctly soft and flabby consistency. In chronic cases, the fundus is hard and retracted.

If the cervix remains closed and bleeding persists, we must judge of the vitality of the ovum by the quantity of blood lost. The maximum amount a patient can lose without destroying the gestation varies considerably. Necessarily, a hæmorrhage in the upper portion of the decidua is more fatal to the ovum than one occurring near the internal os. Thus we see abortion in progress with only a slight hæmorrhage, while instances are not wanting where a loss of from five to thirty ounces is not incompatible with the preservation of gestation. A uterine hæmorrhage is more serious when occurring in the early weeks of pregnancy. In the chronic form, a patient can lose more blood than in the acute variety. A sudden profuse bleeding usually denotes an inevitable abortion. Expectant treatment is permissible in chronic hæmorrhage, provided the drain does not overtax the patient's strength and vitality, and the constantly growing uterus proves that the child is alive. This bleeding frequently stops at the fourth month. If the uterus ceases to increase in size, we may infer that the ovum is dead and degenerated and its removal is called for. To delay active treatment is to invite infection and further loss of blood. Should the contents become infected, a continuance of gestation is impossible.

When it is decided that the abortion is inevitable, the treatment depends upon the conditions present when the patient is first seen. This treatment will be taken up seriatim.

TREATMENT OF INEVITABLE ABORTION

1. *Cervix closed. Fœtus and decidua in utero. Hæmorrhage.*

In the present classification, a closed cervix is one that will not permit the passage of a finger as far as the fundus. The occurrence of hæmorrhage in inevitable abortion calls for active treatment. If the source of hæmorrhage is located in the lower portion of the vera, the loss may be serious. If situated higher up, the oval mass acts as a plug and severe hæmorrhage is the exception until the fœtus is expelled. If bleeding is slight but continuous, treatment should be instituted to save the mother from prolonged asthenia and debility.

The older methods of treatment, namely, administration of ergot, hydrastis, and quinine, ice bags or cold compresses on the abdomen, vaginal and intrauterine irrigations, are all inefficient and useless because valuable time is lost. The method of election in these cases is the vaginal tamponade.

A properly introduced tampon usually arrests the bleeding when the vagina is small and resistant — primiparæ. One great advantage of this treatment is that it does not interfere with the normal mechanism of abortion but affords a sufficient time for the spontaneous separation of the decidua. By irritating the nervous ganglia in the anterior vaginal wall, it tends to increase the efficiency of the uterine contractions if already present, but its power of initiating pains is somewhat feeble. The technique can easily be mastered and the material is available in all cases.

The tampon is not always effective. If the vaginal walls are relaxed, it may be difficult to retain it in position and maintain its effectiveness.

If the ovum is intact and uterine contractions are absent, the vaginal tampon is useless in terminating the process. Bleeding is only arrested until the tampon is removed. It then recurs. Exceptionally, during a tamponade, the cervix closes, bleeding stops, and the gestation continues. Bleeding may also continue on top of the tampon and seriously affect the mother. This is shown in Klotz' case. His patient was thirteen weeks pregnant and had bled for four weeks After a severe bleeding for one hour, a vaginal tampon was introduced. The next morning the patient collapsed, though no blood appeared externally. The uterus had attained the size of an eight months' pregnancy and was filled with blood. The woman died one hour later.

Another drawback is the danger of sepsis and entrance of air into the placental sinuses. Sepsis can be avoided by proper antiseptic precautions and the use of proper packing material. Drainage is always interfered with during the continuance of a tampon, but this is of little consequence in acute abortion. If pyogenic cocci are present in the upper vaginal vault, the tampon may further their activity. Sellheim, Chazan, and the great majority of the German operators prefer 10 per cent iodoform gauze for plugging. At the Chicago Lying-in Hospital, cotton pledgets are used. The writer has seen several cases where a gauze tampon was unable to stop a hæmorrhage while the cotton pledgets were sufficiently hæmostatic, and yet both tampons were inserted by the same person.

The patient lies in the dorsal position across the table or bed and a careful disinfection is made of the field of operation. A too vigorous scrubbing of the vaginal walls is deleterious, as the pavement epithelium may be scraped off and sepsis favored. The urine is withdrawn by a catheter and a vaginal douche of one-half per cent lysol solution is given. The pledgets are wrung out of the lysol solution as they pack better and prevent the blood from soaking into the material. They are introduced with De Lee's packing forceps and packed into place with two fingers of the left hand. The first row is placed around the cervix and the vaginal vault is firmly packed. The lower canal is filled more loosely in order to prevent pressure on the urethra and bearing down sensations. A T binder supports the whole. This tampon is allowed to remain twelve to twenty-four hours, not longer. The liability to septic infection renders a longer retention dangerous. Danger is denoted by temperature and a rising fever or recurrent hæmorrhage calls for the immediate removal of the tampon.

When the tampon is removed, the findings depend upon the progress of the abortion. If the contractions have been effective, the entire mass may be expelled on top of the ovum. The abortion is then complete and further local treatment is unnecessary. More commonly, the cervix is found dilated and the decidua is to be removed manually as outlined below.

2. *External os closed. Fœtus and decidua in cervix and uterus. Hæmorrhage absent.*

These cases are more rarely met with and are commonly associated with cervical abortion. The ovum has descended more or less into the cervical canal, but on account of the rigidity of the fibres of the external os, no dilatation has occurred. The difficulty is to differentiate from threatened abortion. If the uterine fundus is large and bulbous while the cervix is thin, the abortion is threatened. If the opposite condition is found, a cervical abortion is present or the abortion is in progress. A certain amount of blood collects in the uterine cavity. Cervical abortion is best treated by dilating the fibres of the external os artificially either with the fingers or Hegar's dilators. When the resistance of these fibres is overcome, the remaining dilatation is often accomplished by nature if the contractions are strong. In such cases, the patient is left alone, provided she is in a hospital or skilled assistance is available. This precaution is to insure immediate assistance in case a sudden hæmorrhage occurs subsequently. If the patient is placed where such assistance is not available, the vaginal tampon is valuable as a prophylactic measure, as hæmorrhage is inseparable from abortion in its later stages. No attempt should be made to rupture the membrane as this tends to prevent the expulsion of the intact ovum.

3. *Cervix dilated. Fœtus and decidua in utero. Hæmorrhage.*

The ability to pass one or more fingers into the uterine cavity removes one of the greatest obstacles in the operative treatment of abortion. In many cases the process will terminate spontaneously but the hæmorrhage offers an imperative indication to interfere and terminate the process at once.

The first procedure is to ascertain whether the ovum has become separated and detached. Generally, the inferior segment is loosened and the bleeding issues from this area. Using the gloved finger as a curette, the mass is gently and systematically detached from the uterus. This maneuvre is best accomplished when the pregnancy is in the second and third month. If necessary to reach the fundus, it is advisable to pass four

fingers or the whole hand through the vulva, a matter of little difficulty in multiparous patients.

When the mass is separated, an attempt is made to remove it manually, and this is possible in a great majority of cases. In certain cases, manual removal may be difficult or impossible, as in rigidity of the cervix with large fœtus, thick abdominal walls, small perineum or vaginismus, displacements of the uterus due to pelvic disease may interfere with its performance. The great advantage of the sensitive and living finger is everywhere admitted.

If manual removal cannot be done, Hoening's abdominovaginal compressions may be tried. This method was first described by Hoening and later recommended by Budin and Ahlfeld.

Certain contraindications may exist which render its performance hazardous or difficult.

1. Lack of thorough separation of the decidua from the uterine wall.

2. Insufficient dilatation of the cervix to permit a passage of the ovum.

3. Rigidity or hypersensitiveness of the abdominal walls, also obesity, rendering external manipulation difficult.

4. Retroflexion of the uterus.

5. Inflammation or infection of the adnexa or periuterine tissues rendering external manipulation dangerous.

The technique consists in passing two or more fingers to the posterior cul-de-sac. The external hand is applied over the abdomen where circular massage and counterpressure is made. The uterus is caught between the two hands and all fragments are expelled into the vagina. If the uterus lies in anteflexion, the method is easier, less painful, and more effective because of the greater accessibility of the fundus.

Hoening's method only removes the loosened fragments, hence its effectiveness depends upon the preliminary preparation. In a few cases, a secondary hæmorrhage has necessitated further operative procedures.

Budin is an active supporter of this treatment. He advises narcosis, preliminary digital separation by two fingers, removal of all large pieces digitally, and the remainder by abdominovaginal compression. Maygrier and Demelin have obtained excellent results and recommend the method highly. Jacub used digital removal and Hoening's method successfully in 40 consecutive cases. He states that the curette and all instruments are dangerous in these cases. Gessner claims that it is possible to remove all the large pieces by Hœning's method and the remainder can be so destroyed that they are removed by a douche. Larigaudry recommends the method when digital removal fails. He places the patient under deep anæsthesia, breaks up the fœtal mass into fragments and completes the process with bimanual compression. He reports ten successful cases. Stratz, who used the curette only five times in 486 abortions, recommends digital removal in all cases. If this is impossible, Hoening's method should be tried under deep anæsthesia if necessary.

When the mass has been removed, the hæmorrhage usually ceases and further local measures are to be avoided. Exceptionally, the bleeding continues or recurs after an interval and the placental forceps or curette are necessary to remove the still adherent fragments. Usually a curettement is unnecessary. No packing is necessary unless hæmorrhage from uterine atony is present. If used, it should be removed within 24 hours. The patient is to be placed on moderate doses of ergot and hydrastis to promote uterine involution.

4. *Cervix dilated. Fœtus and decidua in utero. No hæmorrhage.*

Artificial assistance is indicated in this condition when it is apparent that the uterus is unable to expel the ovum spontaneously. A prolonged retention is dangerous to the mother because of the liability of sepsis and hæmorrhage. If she has lost considerable blood already, a further loss might be serious. If the contractions are active, an expectant treatment may be followed for a time. Practically, inasmuch as all necessary conditions are present, most operators prefer to empty the uterus at once.

5. *Cervix closed. Fœtus expelled. Decidua in utero. Hæmorrhage..*

A large number of cases fall under this heading of incomplete abortion. It is common to observe contractions continuing until the fœtus is expelled. At this time, they weaken, the cervix closes down, and hæmorrhage occurs.

Opinion is still at variance on the method of obtaining sufficient dilatation of the cervix to complete the abortion artificially. The most popular methods employed are tents, steel dilators, and the uterovaginal tamponade. After the fourth month, the small metreurynter or the finger may be used.

The German operators frequently employ laminaria tents where the cervix is long and rigid. The lack of complete asepsis, the danger of introducing septic material into the uterus, and interference with proper drainage are the main disadvantages of this method. A sinuous condition of the cervix makes the introduction of tents

difficult and not a few cases are on record where such tents have been forced into the parametrium. Heinick recommends that the length of the tent be equal to that of the uterus in order to prevent it from slipping beyond the internal os. The patient suffers materially from pains from 16 to 20 hours under this treatment.

The steel dilators generally used are the Goodell instrument and Hegar's sounds. Their use in acute abortion is attended with danger unless skillfully used. The soft tissues of the cervix are easily lacerated and the tears may extend into the parametrium or peritoneal cavity. Especially in the presence of sepsis is the danger of rupture and perforation increased. The muscular fibres undergo hyalin and fatty degeneration and ultimately necrosis. If these changes are marked the dilator may perforate with only a minimum amount of force applied. Heinick has recently collected 16 cases of perforation with steel dilators. Five deaths resulted. One precaution in using Hegar's dilators is to avoid using unnecessary force in introducing the sound through the internal os. In two recent cases, the author has seen the sound slip into the uterus and through the fundal wall before the operator could control its movement. The first woman recovered after packing the uterus. The second had a large hæmatoma form under the peritoneum. This was removed by laparotomy and the perforation closed with sutures. This woman also recovered.

The method of election in cases where immediate removal is not indicated is the uterovaginal tamponade. This permits uterine dilatation by the natural powers. The utero-vaginal tamponade not only has the power to increase pains but also to initiate them after uterine action has ceased. The principal danger of this form of treatment is from sepsis introduced from below.

The indications for the uterovaginal tamponade are given by Chazan as follows:

1. When the ovum is intact and hæmorrhage is not controlled by vaginal tampon.

2. In incomplete abortion when the cervical canal is nearly closed.

3. In placental retention where the position of the uterus is such that artificial removal appears difficult or where one can wait for uterine action and this is more likely to be the case the more advanced the pregnancy.

4. In long continued and painful manipulations where former hæmorrhages have weakened the patient and where prostration is imminent.

5. In hæmorrhage from retained fragments after digital curettement. If it is impossible to remove all the fragments with fingers, the uterus may be firmly tamponed. When this is removed, the fragments are detached simultaneously.

The plugging gauze should be impregnated with an antiseptic substance, either lysol or 10 per cent iodoform (Dührssen). Salicylic and boric acids are largely used. Nihoff recommends 20 per cent iodoform gauze and permits it to remain 3 days in the uterus. Plain sterile gauze is not as valuable.

The cervix is exposed by drawing it down with volsella and after the usual antiseptic precautions, a small tubular packer is introduced into the uterine cavity and the area filled with a strip of antiseptic gauze. A portion is left protruding from the cervix to façilitate its removal later. The vaginal cavity is packed with cotton pledgets and a T binder supports the whole.

By stimulating uterine contractions, the uterovaginal tampon indirectly dilates the cervix although it does not always effect a complete separation of the decidua. The need of a mass resisting the contractions is well shown by the action of the pains before and after the fœtus is expelled. The tampon supplies this mass in an ideal manner.

The tampon is permitted to remain from 18 to 24 hours. If a patient bleeds after a number of hours, it is probable that the decidua has become separated and expelled from the uterine cavity. A second tampon is rarely indicated and repeated manipulations are to be deplored. If the cervix is found dilated upon the removal of the tampon, the ovum is to be removed digitally, aided by Hoening's method if necessary. After the debris has been removed, all local treatment is avoided.

Included under this heading are a number of cases where it is difficult or impracticable to dilate the cervix artificially. Carcinomatous or fibroid infiltration of the cervix, unyielding scar tissue, inflammatory exudates in the parametrium, exceeding friability of the cervix, or cases where a prior attempt at dilatation has resulted in deep laceration, all furnish contraindications for forcible dilatation. In such cases, an attempt is made to curette with the steel curette.

The advantages of instrumental curettage are stated to be as follows:

1. It is possible to sterilize the curette thoroughly.

2. Instrumental curettement can be done without the preliminary dilatation necessary for digital curettage.

3. Instrumental curettement may be done without narcosis while in primiparæ with unyielding abdominal walls and perineum or where the patient is very sensitive, manual curettage is impossible except under narcosis.

4. If narcosis is necessary to permit dilatation, its employment is unfavorable in severe cardiac disease or in high grades of anæmia.

5. The curette can remove fragments of decidua inaccessible to the finger.

6. In late or chronic abortion, the curette is necessary to remove the firmly adherent masses or semipolypoid formations growing upon the thickened endometrium.

The disadvantages of the curette are as follows:

1. The danger of perforation is far greater than in digital curettement.

2. If the muscular wall of the uterus is atrophic or softened, serious injury may be inflicted upon it.

3. The curette is at best an uncertain instrument in the uterine cavity as compared with the finger.

4. The curette is inefficient after the third month on account of the size of the fœtus.

5. In septic cases, the curette is dangerous because it displaces the thrombi in the sinuses, breaks down the protective wall of Bumm, and invites further infection.

6. It is often impossible to remove all decidua with a curette.

An instrument capable of inflicting so much damage should not be lightly regarded nor used with impunity. Its routine practice is dangerous in the hands of a general practitioner. In the presence of extrauterine puerperal sepsis, it should never be used.

The authorities are nearly all agreed upon the great advantages of digital over instrumental curettement and the various morbidity and mortality statistics bear out their claims.

A brief review of some of the late authorities is given to emphasize the importance of digital treatment in abortion. In Bumm's klinik from 1900 to 1903, five hundred cases of abortion were treated. The tampon was used in 496 cases followed by digital curettage. In the remaining four, digital removal was followed by a light curettement. Gessner has treated hundreds of cases *without* the curette and they all did well. He claims the finger is better and safer. Freund treated 180 cases by digital curettage, only six with the curette, and seven with dressing forceps. Sanger prefers the manual method though he uses the curette lightly after palpating the retained masses with the finger. Ohlhausen and Veit prefer manual removal or the dressing forceps under the guidance of the finger. Chrobak rarely uses the curette. Zweifel only uses the curette in chronic abortion where a small part of the decidua is retained, where uterine involution is in progress, and dilatability small. He states that no instrument can compare with the finger. Sittner prefers to curette lightly after digital curettage. Koerling advises digital curettage but states that the dangers of the curette are overestimated. Winter uses the curette only when small pieces are left and the cervix only partially dilated. Walther only uses the curette in chronic cases but also thinks the dangers of the curette overdrawn. Stratz used the curette only five times in 486 abortions and then only because ergot had been administered.

Grigoriantz removes the decidua manually if the cervix admits two fingers, otherwise the curette is used. In sixty cases, the curette was used thirty-nine times. Kuppenheim treated eighty-four cases in Heidelberg. The curette was used fifty-three times. He tries digital curettage first but if the cervix is too small, the curette is used without further dilatation. Doederlein only uses the curette in endometritis post-abortum. He dilates the cervix with tents and removes the decidua manually and always in narcosis. Gusserow and Orthmann state that the curette is exceedingly dangerous. Jacub has no use for the curette. He treated forty cases manually. Grapow claims that all pieces can be removed manually after dilating the cervix with Hegar's dilators. He uses neither curette nor dressing forceps. Huber does not believe that the curette is necessary when the cervix is small. One should dilate and use a finger. He uses the curette in very early abortion and to remove small pieces. Mueller dilates the cervix under narcosis and removes the decidua in acute abortion with a finger. All polypoid growths and strings hanging from the uterine wall in chronic abortion are removed with the curette. Maygrier uses digital removal in narcosis. The curette is only used when guided by the finger. He curetted forty-four cases out of a hundred and lost two mothers from uterine perforation. Abel always removes the decidua manually in narcosis and is always successful. Hauff dilates with Hegar's dilators and removes the decidua manually. In 275 cases, he used the curette and finger but six times. Dressing forceps were used seven times.

Franz uses the finger if the cervix is open but removes the small pieces with the curette. In 844 cases in Halle, the curette was used 709 times. Lantos only uses the curette in chronic abortion where the swollen decidua blocks the cervical canal. In 300 abortions, manual curettage was successful in 246 cases. The dressing forceps were used four times and the curette in fifty cases of chronic abortion. Leopold warns against the curette. He dilates the cervix with tents or Hegar's dilators and removes the decidua manually. Small

fragments may be removed with dressing forceps. Horschelmann dilates the cervix in narcosis and curettes digitally. The curette is only used in chronic abortion. Szabo prefers digital removal where the cervix is sufficiently dilated, otherwise he uses the curette or the dressing forceps. Beuttner curetted twenty-seven women in a series of forty cases. He claims that fragments retained after digital removal cause chronic endometritis. He uses the curette because it is not painful, requires no narcosis, and can be done through a small cervix. Fischer used a curette 69 times in 99 cases. The digital method was resorted to in thirty cases. Lowenhaupt uses his fingers wherever possible. The loose pieces can be removed with dressing forceps. The curette is used in chronic abortion but always under guidance of the finger. Narcosis is to be avoided. Lawrence curettes digitally and then paints the uterus with tincture of iodine. Ekstein uses dressing forceps to remove the larger pieces and a curette the smaller ones. This should be preceded by digital exploration. Solowij uses a modification of Bandl's speculum and removes decidual remnants with dressing forceps. If immediate removal is not necessary, he uses the tampon. This is done without assistants. Eisenberg reports good results by curettement. d'Archia reports forty-one incomplete abortions where he curetted and immediately irrigated the uterus with a one per cent solution of lysol. He uses a blunt curette under guidance of a finger. He obtained no bad results. von Braun-Fernwald uses a blunt curette where separation with the finger is impossible or is possible only under narcosis. With a curette, the fragments can be removed without pain and quickly. He does not advise its employment as a routine measure. Winckel removes the ovum manually and follows with a douche. He states that the curette is bad in all cases. De Lee advises the tampon, manual removal, and in the early weeks where the decidua is adherent and the finger too cramped to work properly, the curette under guidance of the finger. J. Clarence Webster tampons the vagina, removes the ovum manually, curettes away the smaller pieces, and gives a hot douche. In the fifth and sixth months he uses a Barnes' bag. Finally, Williams packs the cervix and vagina with sterile gauze, removes in twenty-four hours, and curettes digitally. If hæmorrhage is serious or the cervix too resistant, he uses the curette. He emphasizes the importance of using the trained finger wherever possible.

A majority of the authorities prefer the steel curette in chronic abortion where the decidual remnants are firmly attached to the uterine wall and where involution is well advanced. In these cases, perforation is the exception. If the cervix is rigid and incompletely dilated and digital removal impossible, many operators advise the curette.

Instrumental curettement is always a surgical operation and requires the assistants and surroundings that rightly belong to other operations. If these are not immediately obtainable, the patient can be packed in the interim. The work in the out-door department of the Lying-in Dispensary has been done in the most unhygienic and unsanitary surroundings imaginable and yet the best of results have obtained. This experience leads to the statement that the antiseptic environment and clean work rest entirely with the operator himself. It will be found that women living in the lower strata of life will be more immune to infection than those better cared for. The patient should always be operated on a table. Ether or choloroform is given as an anæsthetic. The anterior cervical lip is brought down to the outlet with a volsellum and the length of the organ determined by careful examination. A curette is passed over the entire uterine cavity and the decidua removed. If it is possible to introduce the finger, this should always be done. The curette should never be introduced blindly into the uterus. The tip of the examining finger is ever the eye of the curette. After the uterus is emptied, the hæmorrhage usually stops. If it continues, a hot douche is given for its hæmostatic action and to remove loose fragments. If the hæmorrhage persists, the uterus is packed with lysol gauze. Otherwise the patient is placed on ergot and hydrastis and left alone. The dictum is current that curetting should be continued until the peculiar grating sound is heard and that this sound may be elicited everywhere except over the placental area. The author has found it over the placental site as well as in the distribution of the vera. Furthermore, grating does not always indicate that the decidua is removed. Nassauer curetted a woman until the grating sound was heard distinctly. Later, the decidua was expelled and an examination showed that he had curetted only in the interior of the oval sac.

In a certain number of cases it will be found that a well-formed placental forceps will enable the operator to remove decidua wholly inaccessible to the finger, and in these cases the use of the forceps is preferable to violent manipulations with the finger. If fragments are located with the examining finger, it is usually easy to remove them with the forceps. A broad tip in the instrument will render any danger of perforation very

slight. Nevertheless, great care must be exercised as reports are on record where the operator has drawn down omentum, mesentery, and intestine to the cervix.

6. *Cervix closed. Fœtus expelled. No hæmorrhage.*

The absence of hæmorrhage gives the operator more time to rely upon those measures that tend to complete the abortion normally. If the patient is in good condition and not infected, the cervicovaginal tampon is the method of election. This stimulates normal dilatation and frequently results in spontaneous separation of the decidua. Upon removal of the tampon, the mass, if still in utero, may be removed manually combined with Hoening's method. If the cervix is undilated and manual dilatation and removal is contraindicated, the dressing forceps or curette may be employed.

7. *Should the curette be used after the complete emptying of the uterus?*

The opinion that the curette should be used after a complete emptying of the uterus is becoming less general. It is physically impossible to remove all the tissue with a curette. This has been repeatedly shown in cases where the organ has been removed immediately after the curettement. Williams states that when the ovum has been expelled intact, there is no necessity for further interference. As a rule, if the vera is not cast off, it is not advisable to attempt its removal with the curette. Dührssen has shown that the curette separates the decidua in the ampullary layer while in finger curettage and especially in the compression method of Hoening, the decidua is separated in the same layer. Puppe has shown that the decidual remnants do no harm when left in the uterus. Winter has the same opinion. Generally speaking, if all the masses palpable by the finger are removed or so destroyed that they can be removed by the douche, the finishing touches by the curette are unnecessary. It is not the experience at the Lying-in Hospital that these women commonly suffer from polypoid formations or endometritis with its various consequences.

8. *When is ergot indicated?*

The same rule applies in the early months of pregnancy as at term. Ergot should not be given until the uterus is empty. The poorly developed muscular fibres of the uterus do not respond to the action of ergot as they do at term. Later in pregnancy, ergot causes tonic contractions of the partly emptied uterus and the cervix may close down and cause difficulty in removing the remnants. Decidual debris is better separated by intermittent than by tonic uterine contractions.

9. *The treatment of septic abortion.*

In septic abortion with a poorly dilated cervix, a cervicovaginal tamponade is introduced until it is possible to pass in the exploring finger. This tampon is repeated once if necessary. If the fœtus is not expelled, it is removed manually together with the decidua. If the fœtus and membranes are expelled with the packing and no offensive uterine discharge or hæmorrhage follows, Watkins considers the uterus empty and it is left alone. No intrauterine irrigations, packing, or curetting are indicated. De Lee states that the uterus should be left alone in all cases where there is an irritation of the peritoneum or a beginning peritonitis, where acute exudates are present in the parametrium whether there is anything in the uterus or not. He teaches a rigid policy of noninterference in these cases. The author has recently called attention to the great harm in local manipulations in sepsis unless the infection is limited to the interior of the uterine cavity. If the patient is seen early, the infection is outside the general system though inside the uterus and if the protective wall of leucocytes is well formed, the infection is local only. These women will recover if left alone, provided the drainage is free. Local treatment, especially curettement, may act like signing their death certificates. Schmauch regards the uterine cavity as sacred in the puerperium. In one of the large kliniks in Berlin, every abortion with a temperature of over 102° F. was regarded as septic. It was treated at once. Laminaria tents were used and no tampon. Only a small portion of these patients developed sepsis.

10. *The after treatment of abortion.*

The after treatment of abortion is simple. The patient should lie in bed for a period of eight to twelve days, depending upon the duration of pregnancy. Small doses of ergot and hydrastis are administered daily. External douches of one-half per cent lysol solution are given every four hours and after the natural movements. A sterile pad is retained by a binder. The bowels are moved on the second day by castor oil and then daily by enemata.

From February 15, 1895, to January 1, 1909, the Chicago Lying-in Dispensary has treated 750 cases of abortion. In addition to these, forty-eight women and their cases were dropped or they were so infected that they were sent to a general hospital. Criminal abortion was found only thirty-two times though doubtless many others

were unrecognized as such. All these patients were cared for in their homes and the sanitary surroundings of many of the places can only be appreciated by those who have visited them. The women were first seen by the interne and a student and the proper treatment instituted. Packing is always done by the interne. The final operation is performed in the presence of a member of the staff.

Threatened abortion occurred 276 times (36.80 per cent). The condition was diagnosed by the history, enlarged and softened uterus, pelvic pains, and hæmorrhage. No internal examination was made in 95 cases (34.4 per cent). The patient was placed in bed at absolute rest and was given morphine (gr. $\frac{1}{6}$) or codeine (gr. $\frac{1}{2}$) every four hours. The bowels were moved with magnesium sulphate. Malpositions of the uterus or other causative factors were sought for and removed if possible. Under this treatment, the pregnancy was saved in 201 cases (72.8 per cent). Special difficulties encountered were the refusal of the patient to stay in bed and the too early resumption of work. Of the seventy-five cases lost, sixteen women left their bed before bleeding ceased. It is also worthy of record that forty-eight per cent of the women who finally miscarried gave a history of two or more previous abortions and therefore suffered more or less from chronic endometritis. Of the 201 cases saved, 149 gave no history of abortion or previous uterine disease. Of the women whose pregnancy was saved, 124 were primiparæ, 42 were pregnant for the second time. A healthy endometrium is a decided factor in the prognosis of threatened abortion.

In the first group (Cervix closed. Fœtus and decidua in utero. Hæmorrhage), 54 cases were listed. This condition was treated by a tampon in every instance. In three cases, it had to be repeated. In 12 cases, the ovum was found expelled when the tampon was removed and further local treatment abandoned. Manual removal of the oval mass was effected in 28 cases, while the curette finished the process fourteen times.

In the absence of hæmorrhage, records of twenty-nine cases are found. Packing was done only nine times. In twenty instances, the abortion proceeded spontaneously without local treatment. Of the nine tamponed cases, digital curettage was used five times, dressing forceps three times, and the curette twice.

In group three (Cervix dilated. Fœtus and decidua in utero. Hæmorrhage), eighty-six cases are reported. The finger curettage was used sixty-two times. In eight instances, the abortion became complete during preparations for operation. The De Lee forceps were used sixteen times. The curette was used under guidance of the finger in twenty-six cases to remove small fragments.

Sixteen cases were found coming under group 4 (Cervix dilated. Fœtus and decidua in utero. No hæmorrhage). The uterus was emptied with the finger in all cases. Twice it was subsequently packed for hæmorrhage. The curette was not used.

The largest number of inevitable abortion occurred under group 5 (Cervix closed. Fœtus expelled. Decidua in utero. Hæmorrhage). Here are numbered 184 cases. These were all packed. In twenty-four instances, the decidua were expelled spontaneously on top of the tampon. The cervix became sufficiently dilated to permit digital curettage in sixteen cases. The curette was used 141 times. The Hegar's sounds were mentioned six times in dilating the cervix, notwithstanding the fact that neither these sounds nor Goodell's dilator are found in the dispensary equipment.

Hæmorrhage was slight or absent in forty-two cases, mostly chronic abortion. These patients were all curetted and the contents removed.

Complete abortion was found fifty-one times. No local treatment was given, but the patient was placed on ergot and hydrastis.

Moles were found twelve times, three being hydatiform degeneration of the chorion. The remainder were blood moles.

Although these operations were performed by scores of internes, no history of perforation of the uterus is recorded. All the mothers recovered.

The following table regarding sepsis is reported:

Temperature F°.	Number of cases.	Percentage.
Normal	465	62.0
98.5° to 99.5°	174	23.2
99.5° to 100.5°	69	9.2
100.5° to 101.5°	24	3.2
101.5° to 102.5°	9	1.2
102.5° to 103.5°	3	.8
104.5° to 104.8°	6	.4

Ergot was administered only in the presence of sepsis or where the patient had lost considerable blood and the uterus appeared to be soft and relaxed.

Particular attention is called to the following points in the treatment of abortion:

1. The importance of treating all cases of uterine hæmorrhage accompanied by intermittent pelvic pain in a woman of childbearing age as acute abortion.

2. The value of absolute rest in bed in the treatment of threatened abortion until all pain and bleeding have ceased.

3. The necessity of saving as much blood as possible to avoid a long period of anæmia and prostration.

4. The selection of cotton pledgets in lieu of gauze strips as a material for vaginal tamponage.

5. The use of finger curettement and manual removal of the uterine contents *wherever possible.*

6. The performance of Hoening's abdomino-vaginal compression when the conditions are present.

7. The difficulty of complete sterilization of laminaria tents.

8. The danger of perforation of the uterus with steel dilators and sounds.

9. The great danger of uterine perforation with the steel curette in acute abortion and the value of the instrument in chronic abortion.

10. Curettement should be raised to the dignity and seriousness of a surgical operation and be performed under the same surroundings and with the necessary equipment.

11. The importance of refraining from curetting after the complete emptying of the uterus.

12. The use of ergot after the uterus is empty.

13. Local interference in septic abortion when the infection is limited to the uterine cavity. Less tendency to interfere when the adnexa or peritoneum are involved in the septic process.

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PLASTIC SURGERY OF THE ABDOMINAL WALL

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Abdominal hernia may be defined, in a general way, as a protrusion of the abdominal contents through the abdominal wall proper or beyond the ordinary plane of the abdominal wall. If the contents pass through an actual opening in the fascial wall (inguinal, femoral, umbilical, and postoperative or traumatic), the hernia may be said to be absolute. On the other hand, if a certain portion of the abdominal wall or fascia is weakened to such an extent as to allow protrusion of the contents of the abdomen without an actual opening in the fascial wall (diastasis recti), the hernia may be said to be relative. The principles for the treatment of absolute hernia are well established, while diastasis recti is well treated by Webster's method.

I wish to call attention to another form of relative hernia which occurs occasionally and is manifested by an increase in distance and a protrusion between the umbilicus and anterior superior spinous process of the ilium, due to transverse stretching of the fascia of the external oblique. This condition may be unilateral or bilateral, as shown in Figs. 1 and 2. When bilateral it may be classed under the head of pendulous belly, dwelt upon by Webster and others, but it is anatomically different in that it is external to the recti muscles. This condition is treated as follows: First, split the fascia of the external oblique parallel to the fibers in such a manner as to converge with a like split on the opposite side at a point just above the symphisis; secondly, separate the facia from the internal oblique; thirdly, draw one layer of the fascia under the other with quilt sutures of linen, taking care to have the loop of thread include the fibers of fascia in a transverse direction (Fig. 3, A); fourth, suture the remaining free edge of the fascia to the outer surface of the other layer with a continuous catgut suture to further improve the apposition at the free edge (Fig. 3, B). Thus the distance between the umbilicus and the anterior superior spinous process has been diminished, the protrusion has been reduced, and the fascial wall has been doubled. The result is an abdominal supporter made of the patient's own tissues, and it may therefore be termed an autoplastic bandage (Fig. 4, A). Two cases treated by this method, one unilateral and one bilateral, have been entirely successful. The one was performed eighteen months ago, and the other eight months ago.

EXPANSION OF THE UPPER PART OF THE ABDOMINAL CAVITY

When a patient has been afflicted with a chronic disease which has produced a gradual emaciation extending over a period of many months, and

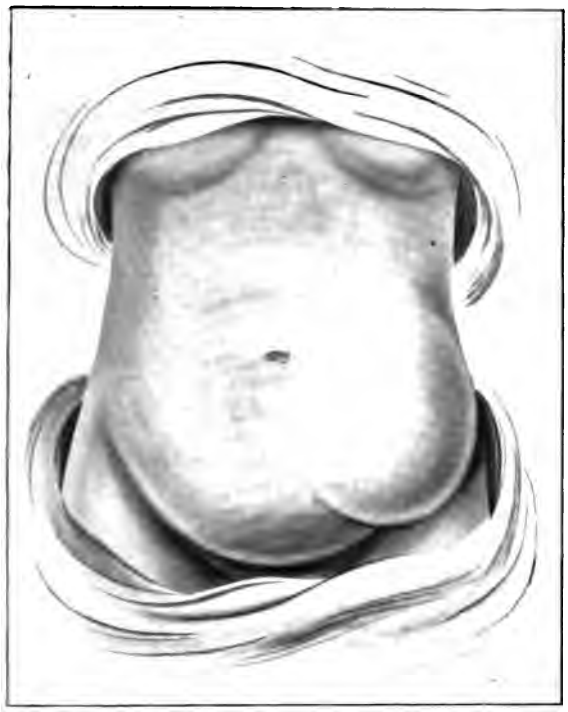

Fig. 1.

Fig. 3.

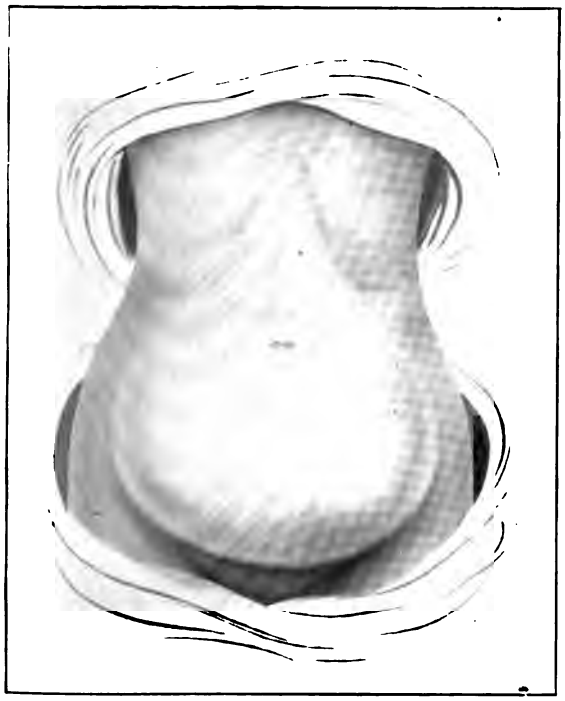

Fig. 2.

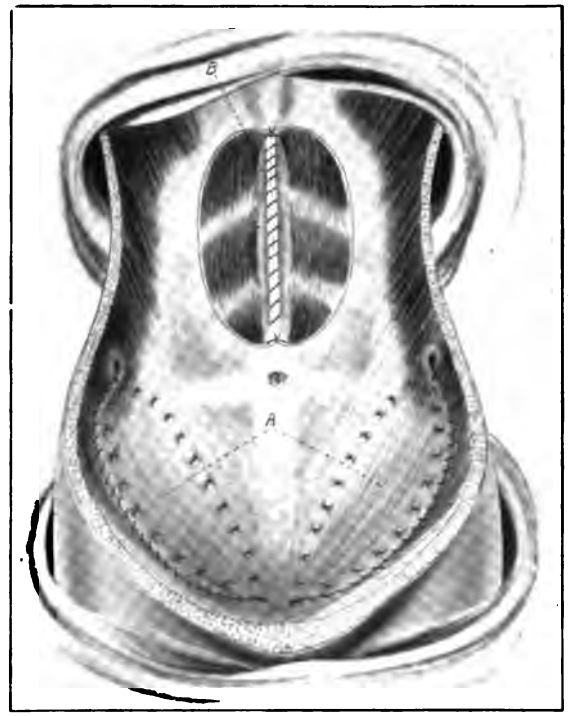

Fig. 4.

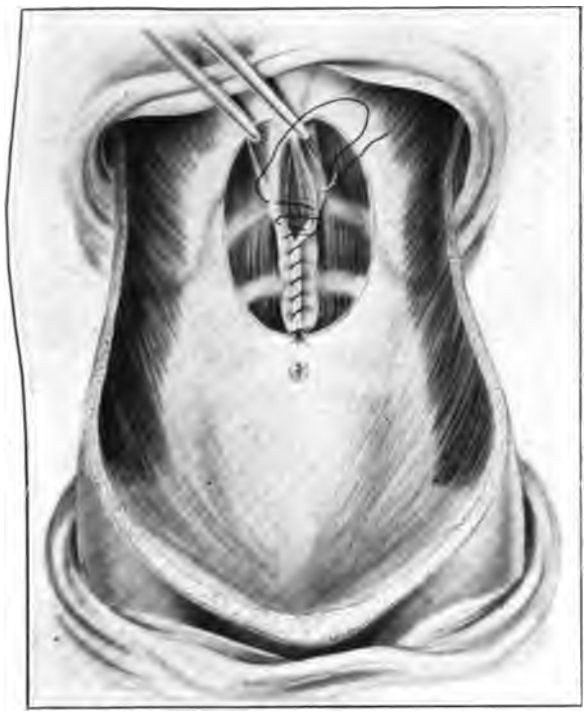

Fig. 5.

may be years, and especially if this disease be of such a nature as to deprive the organism of its normal amount of fluids, such as ulcer or cancer of the stomach, and particularly if the patient be a man who has previously been strong and heavy chested, the abdominal cavity becomes constricted very materially and the tissues of the abdominal wall become firm and leathery. The space between the recti muscles above the umbilicus is increased in an effort to compensate for this. Following an operation for stomach disease in such a case, it is often found very difficult and at times impossible to bring the edges of the wound into perfect apposition. Even if the wound is closed the tension may be so great as to be very uncomfortable for the patient.

In another class of cases in which a certain small per cent are surgical, a patient, who as a rule is a female, has a displaced stomach and liver and accompanying this condition an elongated chest wall which sometimes reaches almost down to the umbilicus. The writer has in some instances seen fit to shorten the ligaments of the liver and suture the omentum to the peritoneum of the abdominal wall. After these organs have been replaced in this manner it is found that the wound can not be closed without making undue pressure. This would tend to destroy the work of the operation. Both of these conditions have been observed more than once before a method of overcoming them by expansion of the upper abdominal wall was thought out.

After carefully studying the fascia of the upper abdominal wall we have put the following operation into practice, and I may state that where the possibility of such an operation is suspected it is well to bear it in mind when the incision is made so that the operator can make it directly in the line of the linea alba and thus avoid opening the sheath of either rectus. After the intra-abdominal operation is completed and the operator is ready to close, the expansion operation is completed as follows.

1. Split the anterior sheath of the recti muscles one inch or more from the median incision and dissect the fascia off the muscles toward the median line (Fig. 5). If the peritoneum is loose enough, it is well to suture it independently of the fascia,

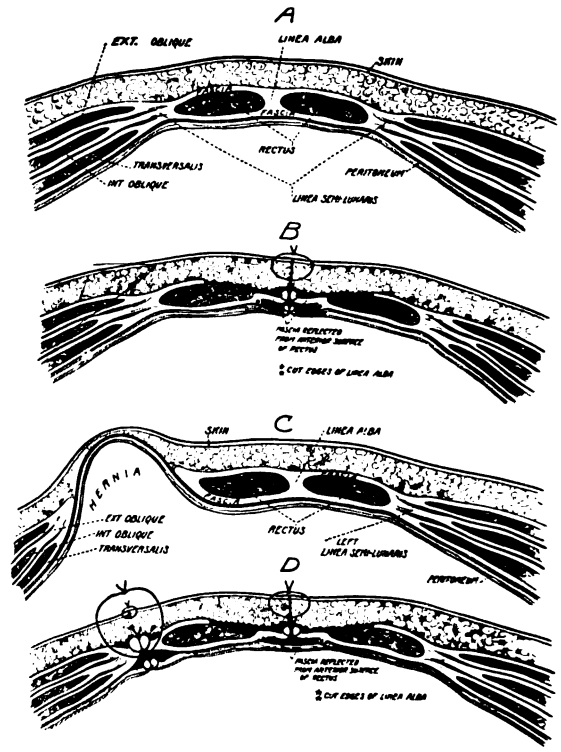

Fig. 6. Expansion of the upper abdomen by reflecting a portion of the anterior sheath of the recti muscles. A, Anatomy of normal abdominal wall. B, Scheme of plastic operation for expansion of upper abdomen. C, Sectional view of hernia following gall-bladder operation. D, Scheme of operation for closing hernia following gall-bladder operation, after expanding the abdomen by plastic operation in the median line.

then suture the reflected edges of the fascia together with strong catgut (Fig. 6, B).

2. The skin and fat may be closed with silkworm gut as indicated in Fig. 6, B (at times I have used a relaxation suture which has included the retracted edges of the sheaths in front of the recti). This parenthetical suggestion, however, is not essential and is not included in the pictures.

By this means the abdominal cavity can be expanded from two to three inches. I have done this operation in cases of ulcer and cancer of the stomach, five times and in cases of ptosis with contracted upper abdomen and correspondingly dilated lower abdomen in two instances, after replacing and anchoring the liver and stomach. In these cases the lower abdomen was narrowed as indicated in Fig. 4, A and B.

The results of these cases have been as perfect as could be expected. In no case has a hernia developed since operation nor has the skin become adherent to the muscle.

One of the principal indications which we have found for expansion of the upper abdomen has been for the repair of large herniæ following gall-bladder operations, such as indicated in Fig. 6, C. Such a hernia is sometimes very difficult to close, especially in fat patients. By expanding the abdomen in the median line the operation becomes simple. The operation in this instance differs from the one previously described in that the peritoneum is not opened. It is done as follows.

1. Make an incision through the skin and fat from the ensiform cartilage to near the umbilicus, and with a piece of gauze expose the fascia thoroughly for an inch or more on each side of the median line.

2. Make a corresponding incision of the fascia in the exact median line and thus avoid opening the sheath of the rectus. (The peritoneum is not opened.)

3. Split the anterior sheaths of the recti muscles an inch or more from the median incision and dissect off from the muscles toward the median line, (Fig. 5). Bring the edges of the fascial flaps together and suture in the median line, leaving the front surface of the recti muscles bare (Fig. 6, D).

With this amount of expansion it is possible to close with strong fascia any hernia which is found in this neighborhood. Occasionally it is very difficult to close a longitudinal incision of the right rectus even in a primary wound, in which instance the expansion operation just described would come in good place.

In this connection I will mention some experiments I have made on dogs, all of which are in accordance with the foregoing statements. In some

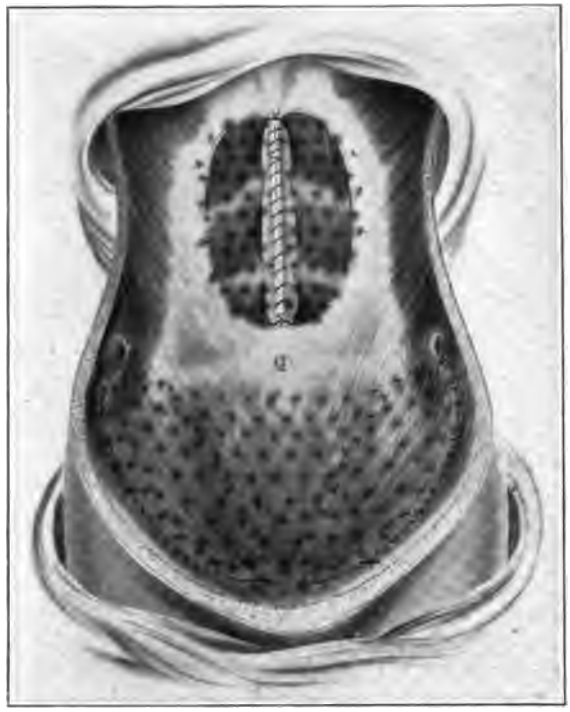

Fig. 7.

dogs I have supplemented the operations shown in Fig. 4 by darning the fascia and muscle as shown in Fig. 7. The darning was done with large linen thread, with the idea of making a stronger abdominal wall after the removal of the front part of the sheath of rectus. This experiment was entirely successful. The threads were completely imbedded in the tissues so that they were not discoverable to the naked eye on cross section. They gave no trouble in any case as far as coming away or suppuration was concerned. The skin did not become adherent to the sutures or to the muscles in any place. By palpation through the skin the indurated area surrounding each thread was easily felt. Where the muscle had been uncovered, as is shown in Fig. 4, dense new tissue had formed, resembling a new fascia, but as it was necessary to kill the dogs two months after experiment, it was impossible to determine whether a true fascia would form or not. I may say, however, that fibrous tissue resembling a new fascia bridged the space across the uncovered muscle perfectly where no darning threads were used. I would therefore, suggest that the darning across the gap is probably an unnecessary refinement in most cases, but that it may be well to know that it may be done with impunity in case it seems appropriate.

AN UNUSUAL CASE OF CONGENITAL MALFORMATIONS

By HERMAN L. KRETSCHMER, M. D.
Associate in Surgery, Rush Medical College, Chicago

For the privilege of reporting this very interesting and most unusual case of congenital anomalies, I am indebted to Dr. Louis E. Schmidt, to whose service the patient, a young man of twenty years, was admitted on February 7, 1909, seeking relief from a chronic urethritis of eighteen months' duration. The interesting features of this case are the congenital anomalies which the patient presents, so that they will be considered at once, there being no connection whatsoever between these conditions and his urethral trouble.

The patient states that he was born with the deformities just exactly as they appear to-day, with the exception that on his left lower extremity he had one toe that grew at a right angle to his leg. To all appearances it looked like the big toe. According to the patient's statement it was a perfectly normal toe, and it also had a nail. The patient does not remember whether he was able to move this toe or not. This toe interfered with the wearing of a wooden leg (peg) and on this account he had the toe removed fourteen years ago. This has been the only surgical procedure that the patient has undergone for his condition. Patient has had the usual diseases of childhood, otherwise he always has been in good health.

The family history in regard to the occurrence of similar congenital defects is negative. He has one brother living and well.

Examination. 1. The right upper extremity. The right arm and the right forearm are smaller than the left arm and forearm, and there is a complete absence of the right hand. At the end of the right upper extremity a good thick pad of soft tissue is present. No evidence of any previous operative interference can be seen. Pronation and supination, as well as flexion and extension of the forearm are perfectly normal. Measurements: the distance from the tip of the internal condyle of the humerus to the tip of the styloid process of the ulna measures 21 cm. as compared with 25 cm. on the left or normal forearm. The circumference of the right forearm measures 15 cm. around the styloid process of the ulna; the circumference of the forearm, 10 cm. above the tip of the styloid process of the ulna, is 15 cm. The left forearm measurements taken at the same places show 16 cm. and 20 cm. respectively. Lateral movements of the radius and ulna on each other are very free at the lower ends. Attention has already been drawn to the presence of a well-developed pad or cushion, such as is usually seen at the end of an amputation stump. The normal lines of the skin are well developed.

2. The left lower extremity. The left leg shows a stump covered with rather thick, firm, red, leathery skin. The end of the stump corresponds to about the junction of the middle and the lower thirds of the leg. The entire limb tapers down very fine so that he has a very long, thin stump, with the slightest kind of a cushion, which in appearance differs greatly from the usual amputation stump, as well as from the general appearance of the right arm. Just below the knee joint a circular deposit of pigment is to be noted, which is due to the pressure of the artificial leg that the patient wears. The patella is present, and as

Fig. 1. Lower end of the upper right extremity, showing complete absence of the right hand.

Fig. 2. Lower end of the left lower extremity, showing absence of the left foot and the rudimentary fibula.

far as can be determined by palpation, is perfectly normal. The head of the tibia is well developed; the tubercle of the tibia can easily be felt, and the crest of the tibia and its anterior surface present no deviations from the normal.

Upon palpating the outer aspect of the left leg, the presence of a small flat bone, freely movable and having no apparent connection with the tibia, is felt instead of the fibula.

This rudimentary bone is 7 cm. long and 4½ cm. wide at its upper end and 6½ cm. wide at the lower end, which measurements correspond with the findings upon palpation.

The right foot shows the presence of three toes. The great toe and the little toe appear to be perfectly normal. The patient is able to flex and extend these toes at will and with perfect ease. Between these toes a smaller one is present, and in contrast to his other toes, he cannot use this toe at all. Upon palpation the first and the fifth metatarsal bones can be felt. No metatarsal bone can be palpated corresponding to the middle toe that is present.

Five X-ray pictures were taken. Figure 1 represents the lower end of the right upper extremity, and shows a complete absence of the carpal bones, metacarpals, and the phalanges. The lower ends of both bones appear to be perfectly developed.

Figure 2 represents the lower end of the left lower extremity. It will be seen that there is a complete absence of the left foot. The left tibia is much smaller than the corresponding right tibia, otherwise it is well developed. The lower end shows the styloid process quite distinctly. Next we turn our attention to the fibula; instead of seeing a fibula that should in a general way correspond to the size of the tibia, a small, light shadow is seen in the upper half of the picture, which is all that is present of the fibula. The X-ray picture corresponds with the findings on palpation, as previously described. This shadow must be interpreted as a rudimentary fibula, the fibula for some reason or another having failed to develop. In order to show the relation of the rudimentary fibula to the knee joint, a picture of the knee joint was taken (Fig. 3) showing the

Fig. 3. Showing the distance from the top of the rudimentary fibula to the knee joint.

Fig. 4. "Spalt defect" of the left foot.

distance from the top of the rudimentary fibula to the knee joint.

Figure 4 represents the X-ray picture of his only foot, viz., the right foot. This picture shows the presence of the first and the fifth metatarsal bones and an absence of the second, third, and fourth. To all appearances, the first and fifth metatarsal bones present are normal. The picture also explains the patient's inability to use his middle toe.

The tarsal bones. The os calcis articulates directly with the outer metatarsal bone; due to an absence of the cuboid bone. The astragalus is present. The astragalus articulates with the scaphoid which in turn articulates directly with the first metatarsal bone, there being no external, middle, or internal cuneiform bones present. In his foot the four distal tarsal bones, viz., the cuboid and the three cuneiform bones, are absent.

SUMMARY

1. Complete absence of the right hand.
2. Complete absence of the left foot.
3. Presence of a rudimentary fibula.
4. Absence of four tarsal bones, viz., cuboid, internal, middle, and external cuneiform.
5. Absence of the second, third, and fourth metatarsal bones.
6. Absence of the second and fourth toes.
7. Presence of a middle toe which is without a corresponding metatarsal bone.

In this case, as in nearly all cases of congenital malformations, the patients generally attribute their defects to certain definite external factors. Thus, this patient attributes his malformations to two sudden frights to which his mother was exposed late in the pregnancy.

It may also be of interest to call attention to the fact that this boy was the second child; and in this connection it might be well to call attention to the figures of Peuch[1] who in a collection of 330 cases of anomalies found:

72 occurring with the second pregnancy.
90 occurring with the third pregnancy.
18 occurring with the fourth pregnancy.
12 occurring with the fifth pregnancy.
8 occurring with the sixth pregnancy.
5 occurring with the seventh pregnancy.
3 occurring with the ninth pregnancy.
1 occurring with the tenth pregnancy.
3 occurring with the eleventh pregnancy.
2 occurring with the twelfth pregnancy.
2 occurring with the fourteenth pregnancy.
2 occurring with the fifteenth pregnancy.

These lesions are due to some defect of development and not to amputations caused by amniotic bands, as can easily be determined by a study of the Roentgen pictures.

[1] Guerrini and Martinelli, Zeit. für Orthopedische Chirurgie, vol. vi.

SOME INJURIES OF THE ELBOW JOINT[1]

By JOHN E. OWENS, M. D., Chicago, Illinois

C. G., a switchman, fell from the top of a car and sustained a compound comminuted fracture of the right elbow. The inner condyle was separated from the shaft and comminuted. The outer condyle was also fractured, but no marked separation existed. The joint was open externally. The upper end of the ulna was intact. Resection of the elbow joint was performed. The olecranon process and lower end of the humerus were removed as well as the upper end of the radius in the proximal side of biceps tubercle. The cavity was filled with gauze and after the usual dressing, a light plaster of Paris cast was employed. This patient came under treatment in June, 1903, and was discharged August 11th. At the time of discharge there was a small opening the size of a pinhead. Flexion was better than a right angle and extension within twelve degrees of the normal. He has been performing his duties as a switchman and is still working.

T. L. received a crushing injury of the elbow joint. There were several punctures about the joint, fractures of the internal condyle, and comminuted fracture of the radius. The joint was resected. The pieces of the condyle, distal end of humerus, upper end of radius removed on the proximal side of the tubercle for the insection of the biceps were removed, and also the upper end of the ulna to include the articulating surfaces. The greater part of the wound was closed; the whole arm, in a flexed position, being enclosed in a light plaster of Paris cast.

The patient came under treatment August 30, 1907, and was discharged November 23d. He could put the ends of the fingers to the mouth, to the top of the head, and, in flexion, could bring the ends of the fingers within three or four inches of the top of the shoulder. Pronation and supination were somewhat diminished. A small sinus existed at the time of discharge.

M. C. W. was injured January 8, 1907. In this case a backward dislocation of radius and ulna at the elbow had been overlooked; fracture of both humeral condyles and the coronoid process. Arm had been dressed in the extended position; ankylosis in extension. Face, neck, left shoulder, and arm were scalded, second degree. Four years previously he received a gunshot wound of right biceps. He came under treatment in April, 1907. Prolonged attempts to reduce the dislocation under anæsthesia, failed. It was suggested that excision of the joint would probably result in a fair range of flexion, extension, pronation, and supination, the arm at this time being ankylosed in the straight position. Unfortunately the ulnar nerve was accidentally divided, but immediately sutured. June 6th the patient went home to remain several weeks. He wrote me that there was numbness of the little finger and on the adjoining side of the ring finger, and that he could not write satisfactorily. Motions of the fingers, however, were perfect. July 26, 1907, the surgeon reported as follows: Flexion and extension normal; no pain in joint or arm; pronation and supination restricted forty per cent; uses arm in any kind of light work; arm growing strong and more useful, although sensation in little and ulnar side of ring finger has not returned.

Under date of November 3, 1909, I received the following report from his physician: The patient has absolutely perfect use of elbow joint; some deformity of little finger, sensation of little and ring fingers, still absent.

C. S., a painter, fell from a ladder and was said to have dislocated both bones of the forearm backwards. He was taken to a neighboring town, and the arm dressed in the straight position. He was then transferred to his home, where another surgeon took charge of him. Taking the correctness of the first surgeon's opinion for granted, the plaster of Paris dressing was not removed for two or three weeks. The man came under treatment January 5, 1907. On the 10th an effort was made to reduce the dislocation but without success. The radius and both condyles were found fractured. Excision of the elbow joint was performed for irreducible dislocation and fracture of both condyles, January 29, 1907. The cavity was packed with gauze. He was discharged March 12th. The usual movements were present February 19, 1909, it was reported that the patient was working as a night watchman in a hotel, that the strength of the arm had increased, and that he was able to shovel coal into a furnace. In this case there was rather too much motion at the joint; more lateral motion than was anticipated (wabbling). A brace permitting the usual motions of the arm was devised and this remedied the defect referred to.

J. H., age 25 years, on March 25 1908, received a compound comminuted fracture of left forearm,

[1]Read before the Chicago Surgical Society, November 5, 1909. See discussion, page 101.

near the elbow joint, and a simple fracture of the eighth rib. The fractures were said to have been reduced. The patient came near dying from traumatic pneumonia which set in April 18th. It was thought, later on, that passive motion was all that was required. Finally the patient having been referred, examination and skiagraphs revealed fractures in upper fourth of radius and ulna, with considerable displacement and likewise a dislocation of the upper end of the radius upwards and forwards. Pronation and supination were abolished. Extension was dimished ten degrees. By using some force, the arm could be flexed to a right angle, but at that degree abruptly stopped; flexion was painful. Some interesting points were brought out concerning the difficulties in the reduction of a dislocated radius. The upper piece of the radius was joined to the upper piece of ulna by a bony bond of union. At this place the interosseous space was obliterated. Having first cut away the bony bond, just mentioned, between the radius and ulna, an effort to reduce the dislocated head by traction and pressure on the head of the bone proved unavailing. This upper piece was then grasped by lion-jaw forceps, the bone being somewhat protected, but direct traction on this, combined with flexion, extension, and pressure on the head also failed. The head of the bone was finally removed through an incision at the bend of the arm, when reduction of the dislocation became easy. The pieces were then drilled and wired. October 12, 1908, flexion and extension were nearly normal, pronation and supination considerably diminished. The patient left for Norway in December and there was just a perceptible flexibility at the seat of the broken bone. A small sinus also existed at this time.

A dislocation of the head of the radius is very often overlooked, particularly if the ulna be broken. I might state in this connection that a fracture in the upper quarter of the ulna is associated very frequently with a dislocation of the head of the radius forwards and upwards, as the direct violence which broke the ulna, unless it immediately stops, knocks the radius out of place. Indeed of late years, wherever I have encountered a fracture of the ulna in the locality named, I have looked for a dislocation of the head of the radius and have not usually been disappointed, and the reverse is also true that if a dislocation of the head of the radius forwards and upwards takes place, it is to be expected that a fracture of the upper fourth of the ulna has occurred.

On October 14, 1908, J. V. was standing about four hundred feet distant from a point where a boulder was being blasted; a piece of rock struck him on the left elbow, causing a compound fracture of the ulna within two inches of the joint. From a small opening in the soft parts, there was a continuous but not severe hæmorrhage. The wound was sufficiently enlarged to permit the entrance of the finger for examination. The injury was considered serious and the prognosis uncertain. Several fragments of bone were removed at the first dressing, the largest of these being an inch in length. Suppuration followed. On December 8, 1908, it was noted that motion of the elbow joint was limited, the latter being painful and enlarged. Immobilization of the arm was discontinued after the third week, but passive motion and massage substituted. February 21, 1909, it was discovered that there was no bony union, spongy portion of the fragment being necrotic, and the joint cavity opened. Firm ankylosis of the elbow took place with the arm in semiextension. Surgeon in charge removed the necrotic tissue and it was thought the wound would close in a short time. Fibrous union was broken down in order to flex the arm. Patient was discharged in April, but it was the opinion of the surgeon that he would not be able to perform the duties of a laboring man for several months. Arm could not be flexed to a right angle; pronation and supination fair; extension normal; wounds healed. Opportunity presented itself for an examination of this patient in February and it was found that in addition to other injuries there was a dislocation of the head of the radius upwards and forwards. Flexion could not be brought to a right angle, on account of the head of the radius abutting abruptly against the humerus and other tissues at the bend of the elbow.

A single straight incision at least four inches long, the middle being over the tip of the olecranon is usually sufficient for the excision. The incision should split the triceps and be carried to the ulna over the olecranon and upwards to a moderate degree over the humerus. The overlying structures including the triceps tendon must be peeled from the bone by elevator including the periosteum. Sometimes a thin, sharp chisel will be found useful. The line of section through the bone must be parallel to the condyle, and close above the articular surface so as to pass through the coronoid and olecranon fossæ. The line of section through the ulna and radius must include the lesser sigmoid of the ulna and the head of the radius preserving the insertion of the biceps muscle. After the operation, and the arm somewhat extended but without traction, the sawn surfaces should be one and one-half inches apart. This rule is by no means modern, but it is found to give the best results.

CONCLUSION

1. Such results are better than a tender and painful joint and also better than a stiff arm in any position, and better than one whose motions are decidedly limited.

2. That resection is also an economy of time.

3. That the varied and complicated injuries at and near the elbow joint render diagnosis in many cases extremely difficult.

4. Dislocation of the head of the radius is frequently overlooked especially if associated with a fracture in the upper fourth of the ulna, and such a dislocation should be expected where this fracture exists, and if the dislocation in question is present a fracture in the upper fourth of the ulna should be expected.

5. That a useful arm is to be expected if excision is properly performed.

6. That in any dislocation of the upper end of the radius and the ulna, a fracture of one or more of the bony constituents of the joint is to be looked for.

7. That errors in diagnosis are not confined exclusively to men of moderate experience, but the most experienced and successful cannot claim immunity.

BULLET EXTRACTED FROM HIP JOINT[1]

By EDWARD H. OCHSNER, M. D., Chicago, Illinois

This patient, male, thirty-six years of age, entered the Augustana Hospital April 12, 1908, with the history that on December 31, 1898, he was struck in the right groin by a stray bullet from a thirty-eight caliber revolver. The wound of entrance was on the inner aspect of the groin and there was no wound of exit. A doctor was called at the time, who probed for the bullet, but was unable to locate it. Apart from this probing, the wound was treated expectantly and healed kindly in about three weeks, but patient always noticed a little pain in hip, especially when in motion.

Three months after injury an X-ray showed the ball at the lower mesial junction of the femoral head and the acetabulum. At this time an incision was made in the groin, but bullet was not found. In May, 1907, about eight years after the injury and about one year before admission to the hospital, while lifting a heavy weight patient was taken with a severe pain in right hip. Directly following this he was unable to walk or move joint without excruciating pain. After several days rest to the joint the pain ceased. In July, 1907, another X-ray picture showed the ball in apparently the same position as located by the first X-ray three months after the injury. A third attempt was now made to find the bullet by making an incision over posterior surface of upper end of thigh, but this again failed. One week later a fourth attempt was made by making an incision over anterior surface of thigh, which again failed.

After leaving the hospital this time, pain continued and on several occasions, especially after sudden lifting or on assuming unusual attitudes he had excruciating pain in hip, which was accompanied by inability to move the joint in any direction.

When admitted to the Augustana Hospital, April 12, 1908, the patient's general condition was good. Right hip and right thigh showed several scars, as detailed above, extreme abduction, extension and flexion impossible. On taking a stereopticon radiogram we found the shadow about the middle of the neck of the femur, but were unable to decide positively whether the bullet was anterior or posterior to the bone, though it was clearly not located in the bone itself.

The patient was anæsthetized April 13, 1908, a vertical incision, twenty centimeters long directly over the right hip joint was made through the skin, fascia, and muscle down to the capsule of the hip joint. These tissues were now retracted, the capsule of the joint opened, the anterior surface of the neck of the femur examined, but no bullet was found. I now took a one-half inch gouge and chiseled a hole directly through the center of the neck of the femur and with an artery forceps extracted the bullet through this opening. The bullet was located just behind the middle of the neck of the femur between the bone and the capsule of the joint. The wound was now closed, leaving only a small cigarette drain. A plaster of Paris spica extending from the umbilicus to the right knee applied over cotton with the thigh at slight ventroflexion, abduction, and inward rotation. Four days later drain removed. Thirteen

[1] Case reported November 5, 1909, at meeting of Chicago Surgical Society. See discussion, page 101.

days after operation stitches removed, wound found completely healed. Seventeen days after operation a new plaster of Paris cast applied over stockinette. Patient allowed to go home on crutches May 3d. Second cast removed June 11th, when motion of hip was about as at present. Patient walked very satisfactorily and went back to work, but on July 15th he fell and sprained his right hip, which caused some pain and anxiety, so that on August 1st I applied a new plaster of Paris spica, which was worn for several months. The patient has been at his work ever since, has experienced no discomfort, is rid of the pain and the symptoms of locking, and with motion nearly perfect in every direction he now has a useful hip joint.

I have taken the liberty of presenting this patient and his history to the fellows of this Society, because I believe it certainly is an unusual case.

Dr. Finney and I have looked over the literature with some care and while we are able to find a considerable number of cases of gunshot wounds of the hip joint reported, most of these cases were complicated with fracture of one or both of the bones entering into the formation of this joint. In the History of the War of the Rebellion [1] we find a memorandum of forty-nine cases of shot wounds, which the reporters believed led to the opening of the coxa femoral articulation without direct injury to the bone, but we are unable to find any mention that any bullet was actually found free within the joint capsule.

A probable diagnosis of bullet in the joint was made on the history of locking of the joint and on the fact that the skiagrams showed the bullet in different locations at different periods. It did not seem possible that so large a bullet could travel such a distance unless it were within the capsule.

In this connection I would again like to call attention to the importance of absolute immobilization during the healing of a joint injury. I believe that in such cases fair motion will be obtained in a very much larger percentage of cases by securing absolute immobilization than by resorting to the often recommended early active and passive motion.

[1] History of the War of the Rebellion, vol. iii, p. 25.

TRANSACTIONS OF SOCIETIES

CHICAGO SURGICAL SOCIETY

A REGULAR MEETING WAS HELD NOVEMBER 5, 1909, WITH THE PRESIDENT, DR. ARTHUR DEAN BEVAN, IN THE CHAIR

Dr. A. E. Halstead presented a case of pulsating exophthalmos. (See page 55.)

"A Foreign Body in Hip Joint, with Exhibition of Case," was the subject of a presentation by Dr. E. H. Ochsner. (See page 99.)

DISCUSSION

DR. JOHN E. OWENS: Mr. President, a few years ago I had a case somewhat like that reported by Dr. Ochsner, except that the bullet went in on the outer aspect, as far as I remember, just below the anterior superior spine. The bullet lodged in the upper portion of the neck, along the outer segment of the circumference of the head of the bone. The bullet was removed with considerable trouble, but I regret to say that, having lost sight of the patient a report on the condition of the joint cannot be given.

Dr. John E. Owens presented a paper on "Some Injuries of the Elbow Joint." (See page 97.)

DISCUSSION

DR. D. N. EISENDRATH: There is one point which Dr. Owens has referred to that I believe is generally overlooked in these fractures close to the elbow joint, and that is the frequency with which these injuries are accompanied by severing or contusion of the nerve trunks of the radial, ulnar, and median nerves. In a great many cases the median and ulnar nerves are not severed, but are stretched across the end of the upper fragment in such a way as to produce symptoms similar to the actual severing of the nerve.

I saw recently, within the last week, a case of undetected musculospiral paralysis following one of these comminuted fractures close to the elbow joint. It was a case where a doctor was being sued for malpractice on account of this injury to the musculospiral nerve following a comminuted fracture, and no effort was made at the time of setting the injury to avoid nerve injury, and no information given the family that such a thing had occurred, and no complaint made afterwards. I believe we are apt to think that nerve injuries can occur chiefly in the middle shaft, and overlook the fact that they are not so very rare at the lower end.

There is another point with relation to nerve injuries at this portion of the humerus that I think is apt to lead us astray, and that is the fact that so very frequently we get no anæsthesia. That is to be explained, so the neurologists tell us, by the vicarious action of the associated or neighboring sensory nerves, which rapidly take the tactical sense action of the nerve injured. One cannot depend on that symptom alone.

There is one point that has been brought out, that cannot be too strongly emphasized, and that is the necessity, so far as possible, of taking exercise for the elbow joint injuries, because in many cases the injuries are overlooked. The case is treated for week after week as a simple sprain of the elbow joint, and then suddenly, when the patient recovers from the immediate effect of the swelling, the thought comes that there might have been a fracture of the neck or head of the radius.

Dr. S. C. PLUMMER: Mr. President, I would like to speak of a typical case of excision of the elbow joint, where the functional result quite surpassed my expectation. This man was a switchman, who slipped and fell with his arm across the rail, and he said the car ran over his arm at the elbow. I do not believe this account of the injury, but rather that the car ran over the point of the elbow. His injury was a compound, comminuted fracture of the lower end of the humerus, leaving the forearm bones in contact, however. The muscles at the lower end of the humerus were all pulpified, fragments of bone hanging by shreds of muscles and portions of ligament. The ulnar nerve was entirely exposed for about four inches, standing out as if it had been dissected. The loose pieces of bone were removed, and the humerus sawed off. The ulnar nerve I covered with fascia, and there were never any symptoms at all from the ulnar nerve. This man got a wonderfully good functional result, so good that he pleaded to be reinstated as a switchman. He was not allowed to do such dangerous work, but he is doing actual

railroad work now. The muscles draw up the bones against the end of the humerus, and he gets quite a fulcrum there. The strength of the muscles of the elbow joint was surprising.

THE PRESIDENT: About six years ago, at the Surgical Section of the American Medical Association, at Atlantic City, I reported four or five cases of elbow joint injuries, limited, however, to dislocations, which the X-ray showed in every instance to be complicated with fracture. I operated upon all of those cases and found this, that on exposing the joint and removing the fragment of bone which locked the dislocation, and prevented reduction, that if this was done early, within two or three months, that the joint recovered its function; that in the really ancient cases in which the dislocation had existed for a number of months, or a year or more, even though the reduction was obtained, in spite of passive motion and breaking up the adhesions under an anæsthetic, we obtained a stiff joint. In two cases, instead of making a reduction I made a resection of the lower end of the humerus, and we obtained a very good functional result.

I believe that my experience confirms that of Dr. Owens. I am rather inclined to think I would advocate in these old dislocations where any attempted reduction was made, simple reduction in the very recent cases only, as one cannot be sure of obtaining a good functional result in the very old cases.

Dr. Daniel N. Eisendrath read a paper entitled "Ileus Due to Meckel's Diverticulum."

DISCUSSION

DR. HARSHA: I would like to ask the doctor if a vaginal examination was made in this case.

DR. EISENDRATH: Yes.

DR. HARSHA: In a case which I reported to this Society three or four years ago a vaginal examination showed a distinct tenseness that would lead one to suspect a distended gut. The form of that was different, in that the direction was directly downward from the ileum, and the terminal ligament only two and a half or three inches long, reaching directly over the ileum, and attached to the mesentery of the ileum. In that case there had been two or three abdominal crises that had passed off without any serious consequences, and had not produced complete obstruction. When she was operated the bowels had been obstructed almost completely for four days, with intestinal vomiting. I believe the differences in the symptoms in partial or complete obstruction are mainly the appearance of the patient, showing more or less profound disturbance, and the range of temperature, the temperature remaining subnormal longer in partial than in complete obstruction owing to the delay in intraabdominal infection.

I think a rectal examination in these cases gives one an idea of the intestinal distention which would help differentiate it from appendicitis or other inflammatory conditions.

DR. L. L. MCARTHUR: Mr. President, as illustrating the difficulties of diagnosis of ileus provoked by Meckel's diverticulum, I recall a case seen in conjunction with Dr. Billings, of this city, in which he held up firmly to the diagnosis of appendicitis, I to intestinal obstruction by band. The case became so desperate that operative interference was required. My inclination to fortify my diagnosis led me to sweep my hand underneath the umbilicus immediately on opening the abdomen, and the band was found. The band had caught the appendix close to the caput coli, cut through it and permitted a leakage, with septic ileus as a cause of the intestinal obstruction.

The second case came under my observation last year, of a young girl eleven years of age brought to me for acute septic appendicitis, with a distinct tumor to be felt through the rectum. Before opening the abdomen there were symptoms corresponding to appendicitis, fever and rapid pulse, high blood count, and ileus attending same. I first found that the appendix was perfectly normal, and following the ileum along a distance of eighteen or more inches from the ileocæcal valve I came upon a Meckel's diverticulum of the largest size that it has been my opportunity to view, one much larger and longer than my thumb, without a mesentery, and without a band at its terminal, free end. This seemed to be perfectly normal, and being even larger than the caliber of the bowel, I let it alone. Searching further I found that the ileus was due to a commencing gangrene in a twisted dermoid cyst, prolapsed in the pelvis.

The third case presented a typical history of appendicitis, but was found to be a diverticulitis, with gangrene in the diverticulum simulating appendicitis, which required simply the removal of the gangrenous portion of the bowel to effect a cure.

DR. A. J. OCHSNER: Regarding the diagnosis in cases of intestinal obstruction, unless one has a definite reason for supposing the obstruction to be caused by some condition on the left side of the abdominal cavity, I believe the rule Dr. Eisendrath laid down is not good, because about eighty per cent of obstructions come from conditions in the right side. In some instances the condition may seem to be due to a mechanical obstruction, and

still be due to a perforated gall-bladder or duodenum, or even a perforation of an ulcer in the pylorus just at the duodenal end, or it may be due to intussusception. The condition may be due to inflammation of the appendix, Meckel's diverticulum, perforation of a typhoid ulcer, perforation of the duodenum, gall-bladder, and pyloric ulcer. All these conditions I have seen in cases which were diagnosed as intestinal obstruction, and all these cases could be best discovered through an incision splitting the right rectus abdominis muscle.

Then, as regards the finding of the diverticulum, I have operated on eight cases, and I have made a diagnosis in each case after the abdomen was opened. Before the operation diagnosis varied between all of the above conditions. If one follows the rule that Dr. McArthur has mentioned, to reach up under the umbilicus in order to determine whether there is a band, then beginning at the cæcum, and following the mesentery of the ileum upward and to the left one finds the obstruction in almost every case. You do not have to manipulate the intestine.

In those cases in which there is a great deal of distention above the obstruction, we have repeatedly of late applied Moynihan's glass tube, making a longitudinal opening in the intestine, and inserting a long glass tube, and allowing the liquid fæces to run out. If one tries to shove the tube up into the intestine one fails regularly, and that is why Munks announced that it was impossible to use a glass tube in emptying the intestines. Then Moynihan showed that by folding up the intestines on a glass tube as one draws a glove over a finger, it is very easy.

In the last case we irrigated the intestine, which looked so blue that conditions seemed hopeless. I introduced a little warm normal salt solution through the glass tube, and immediately the intestine began to have a better color. By the time we had filled and emptied it two or three times the color was very fair.

DR. A. E. HALSTEAD: Mr. President, I have been struck regarding the statistics of Meckel's diverticulum. It is well known that they are found at autopsy in 2¼ to 3 per cent of all cases. Statistics also go to show that nearly 5 per cent of all obstructions occur from Meckel's diverticulum. I have seen only three altogether, one that produced obstruction, one perforated with typhoid fever, and one found accidentally, that did not cause any symptoms. I have talked to a number of surgeons about this point, and their experience has been about the same as mine, that comparatively few cases are seen in the course of operative experience.

DR. EISENDRATH (closing the discussion): In a talk this afternoon Dr. Halstead told me of a case of Meckel's diverticulum he had seen.

There is very little I have to add. I am glad to hear that the experience of the gentlemen who have seen these cases is pretty much the same as my own. The majority of these cases are not recognized before operation.

I think Dr. McArthur's suggestion is an excellent one, in regard to palpating the internal wall of the abdomen in order to determine whether there is a diverticulum.

I have had no experience with the Moynihan method, as mentioned by Dr. Ochsner, but I can speak from personal experience with regard to the value of enterostomy. I have had three cases of intussusception in children. Two of them I lost through trying to do a resection. The children were not in any condition to stand resection. The third one was in just the same kind of condition. I did at first an enterostomy, and later on a resection. I believe either enterostomy or cæcostomy in these cases is indicated if we cannot do anything more radical.

The great thing of interest in regard to these cases of Meckel's diverticulum is the various forms in which the ileus may occur. Up to the time I had had this case I really thought there was one form, but upon studying the subject I found it was particularly complicated.

Dr. Dean D. Lewis submitted a paper on "Multilocular Cysts of the Jaw." (See page 28.)

DISCUSSION

THE PRESIDENT: I have seen four or five of these odontomas, and I think they are exceedingly interesting tumors, because it is well known that so many of them have been handled as malignant tumors. I am rather inclined to think that the best short description in English is found in Bland-Sutton's book on tumors. My own experience has been rather varied. All the tumors have been of different types. At one time we had three odontomas at the winter session at the college. One was a single little tumor which grew from the lower border of the inferior maxilla. It was a tooth bud which had evidently turned downward, and had grown along the bone, and projected as a tumor-like mass at the lower border of the inferior maxilla. It was regarded as an osteoma. At the time of the examination it was found to consist of irregular, rather curly shaped enamel which projected from the bone. A second one was the one Dr. Lewis has reported, and my opinion at the time was that it was a malignant growth. I was surprised when she returned three years after

the operation, as I supposed it had been one of those fatal cases of malignant disease. At the time of the second operation we made a radical operation, and established definitely the diagnosis. The third case, which I remember fairly well in detail, was a case in which the cyst-like cavities were filled in with watery fluid, rather a gelatinous substance, and this interesting problem presented itself, whether to resect the lower jaw, or make a conservative operation. I decided on the latter plan, and I found it was possible to do this, and to remove the tumor very thoroughly, with the exception of some portions of several cysts which involved the jaw, which had to be left in order to save a sufficient mass of bone to make a support of the inferior maxilla and the teeth. I did not hesitate to leave those portions of the bone, and curette out the cyst cavities which invaded the bone, touching the surface with carbolic acid. The woman made a very good recovery, with practically no deformity at all, as the incision was well under the line of the jaw. It is now several years since the operation, and I am not in a position to report her present condition, but some months after the operation the condition seemed very favorable.

Another case which I remember was one which seemed to be one of those multilocular cysts which was situated so that the inferior maxilla was expanded around it as a great mass of bone, and was about the size of the fist. A fifth case I have seen recently, in a boy about twelve years of age, the history being that the boy has had the tumor for the last seven or eight years. I was interested in the case because the physician was quite impressed with the fact that it was a malignant sarcoma, and should be removed. I was rather impressed with the fact that it was an odontoma, and that a conservative operation would succeed in curing the case.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

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Benign Tumors, Fibroma, Myoma and Lipoma Encapsulated in the Wall of the Stomach. W. G. SPENCER. *Proceedings of the Royal Society of Medicine*, 1909, ii, 311.

This article collects from the literature all the benign tumors of the stomach reported. Spencer remarks that although sarcomas are more common, benign tumors do occur, and when present can be readily shelled out from the lining of the stomach.

C. G. GRULEE.

Foreign Bodies in the Upper Air and Digestive Tracts, with Special Reference to Oesophagotomy (Fremd körper in der oberen Luft. und Speiswegen mit besonderer Berücksichtigung der Oesophagotomie). MARSCHIK. Wiener Klinische Wochenschrift, 1909, xxii, 1405.

After report of 3 cases of foreign body in the larynx the writer takes up the main subject, i. e., foreign bodies in the œsophagus. He reports 11 cases of œsophagotomy for foreign bodies, two of which died, one of pneumonia and one of a putrid empyema following puncture of the pleura during the operation.

A great deal of emphasis is put upon the X-ray as a means of diagnosis. After careful history and X-ray examination the œsophagoscope is tried in recent cases where the bodies are round and smooth. With sharp bodies, and especially in those cases where the foreign body has been present a long time œsophagotomy is resorted to. The potato treatment is recommended as an early measure.

C. G. GRULEE.

Surgical Treatment of Pulmonary Abscess (Traitement chirurgical de l'abcès du poumon). A. GUIBOURG. Thèse, Paris, 1908.

These are the steps of the operation such as it must be actually practiced:

1. Chloroform anæsthesia. 2. Curvilinear incision, with convexity downward corresponding to the inferior limit of the abscess. 3. Resection of an ample number of ribs, depending upon the seat and the volume of the abscess. 4. Exploratory pleurotomy. In the absence of adhesions, the two layers of pleura must be sutured together. 5. Localization of the pus-collection by the aid of exploratory punctures. 6. The needle being left in place, the lung is opened either with a knife or with a thermocautery, depending upon the state of the pulmonary tissue, or with the index finger. 7. Abscess cavity is closed with tampons impregnated with an antiseptic solution. 8. Rubber drainage tubes are used.

The same author reports a case in which he easily found an abscess the size of a walnut situated four centimeters from the surface of the lung. Two layers of the pleural wall were adherent. The abscess was incised with the thermocautery. Recovery ensued.

Schiassi, to remove a nail impacted in a bronchus resected portions of the fifth, sixth, seventh, and eighth ribs posteriorly; he detached the pleura, exposed the bronchus, and removed the nail. The wound was packed; an extensive subcutaneous emphysema lasting two days was the only incident marring recovery.

AIMÉ PAUL HEINECK.

The Pathological Relationships of Gastric Ulcer and Gastric Carcinoma. LOUIS BLANCHARD WILSON AND WM. CARPENTER MAC CARTY, M: D. *American Journal of Medical Sciences*, Vol. 138, No. 6, 846.

The authors' work is based upon the study of specimens from gastric and duodenal resections and excisions for ulcer and carcinoma by Drs. W. J. and C. H. Mayo, from January 1, 1905, to April 1, 1909. The total amount of material studied comprised specimens from 218 cases. Eight of these were from the duodenum, and were all simple ulcers. The remaining 210 were from the stomach. Of these, 47 were ulcers without suspicion of carcinoma; 2 were sarcomas, 2 adenomas, and 1 a diverticulum.

Of the remaining 158 cases from the stomach, 5 were ulcers with enough microscopic appearance of aberrant epithelial proliferation to place them in the doubtful class as possible transition cases.

Of the remaining 153 cases which were undoubted carcinoma, 109 (71 per cent) presented sufficient gross and microscopic evidence of previous ulcer to warrant placing them in a group labelled "carcinoma developing on preceding ulcer." Eleven other cases (7 per cent) showed evidence of precedent ulcer," but not sufficient to warrant placing them in the previous group. In 33 cases (22 per cent) there was

relatively small or no pathological evidence of precedent ulcer.

The authors conclude as follows: "That carcinomas should develop in the edges of gastric ulcers is only what we should expect; the wonder is that the facts should have been so long in being recognized. This has been due to (*a*) failure to recognize clinically the frequency of gastric ulcer; (*b*) failure to recognize that gastric cancers are not initially pyloric tumors, but extensions thereto from the lesser curvature; and (*c*) giving undue weight to observations at autopsies. When the patient has died of cancer the neoplasm has usually obliterated all gross and microscopic evidence of previous ulcer.

As the pathologist examines stomach specimens from the surgical clinic he constantly observes the following steps in the following sequence:

1. Chronic ulcers from the centers of which the mucosa has disappeared leaving a scar tissue base.
2. In the overhanging borders of the ulcers the mucosa is proliferating.
3. Deep in the borders many groups of epithelial cells have been nipped off by scar tissue and are exhibiting all stages of aberrant proliferation with infiltration of the surrounding tissues.
4. Metastases are forming in the lymphatics of the stomach wall and adnexa.

Adopting Adami's classification we may therefore correctly designate most gastric carcinomas as "blastomas originating from unpotential cells of postnatal displacement," although it is probable that a very small number are "blastomas originating from unpotential cells that assume neoplastic characters without displacement and rapidly assume malignancy."

ARTHUR B. EUSTACE.

Diseases of the Oesophagus (Ueber Erkrankungen der Speiseröhre). KAUFMANN AND KIENBOCK. *Wiener Klinische Wochenschrift*, 1909, xxii, 1199, 1235, 1268, 1303.

This comprehensive article or rather series of articles, takes up very completely diverticula and dilatations of the œsophagus. Only the important points will be taken up in this abstract. For one who is especially interested in the subject the original should be consulted.

The authors first consider the "high seated traction diverticulum." A thorough review of the literature is followed by report of five cases. It was impossible to fill the diverticulum with bismuth solution because on deglutition some of the solution was expelled. Examination with the X-ray led to a diagnosis much earlier than other methods. They next discuss the "deep seated traction diverticulum with cardiospasm." After a review of the literature two cases are reported. In the first case they regard the cardiospasm alone as the cause of the disturbance of deglutition. The cardiospasm is often due to irritation of the œsophageal mucuos membrane found in the diverticulum.

The third variety is the "deep reaching diverticulum with cardiospasm" in which the opening of the diverticulum is high up and the sac extends downward. This variety is discussed much as the former ones, one case only being reported.

The next variety, the "idiopathic dilatation of the œsophagus," is discussed at length. The writers tend strongly to the opinion that in a number of cases the dilatation is due to flaccidity of the œsophageal wall as the result of impairment of the function of the vagus nerve. To stimulate the vagus, atropin was used with quite marked success, especially in the last of the five cases reported. A case which is primarily due to a disturbance of the vagus function may eventually show changes in the mucous membrane and not respond to treatment.

C. G. GRULEE.

Wounds of the Vertebral Artery (Les plaies de l'art ère vertébrale). P. BOUCOUT. Thèse, Paris, 1908. *Archives générales de Chirurgie*, May, 1909.

Of all wounds of the vertebral artery, stab wounds are the most frequent. Hæmorrhage, quite abundant, but easily controlled attends the injury. The initial wound closes. Three weeks after the traumatism an aneurism appears. The rupture of this aneurism most always means death, either by (1) entailing secondary infectious complications; (2) or in the majority of cases, by hæmorrhages (*a*) which are relatively abundant (*b*) every time arrested (*c*) which recur easily (*d*) which owing to their repetition, weaken the patient. Death takes place in from three weeks to six months after the traumatism. Cure is a rare occurrence. In fifty-two cases, there were four recoveries.

Most always, aneurisms of the vertebral artery have been mistaken for aneurisms of the carotid. However, Chassaignac has shown that a precise diagnosis is possible. In wounds of the common carotid or of one of its terminal branches, compression of the vessel practiecd above or below the tubercle of the sixth cervical vertebra stops the hæmorrhage. Hæmorrhage from a wounded vertebral artery is influenced by compression made below and not above the tubercle. In cases of doubt, one is justified in placing a temporary ligature on the carotid. If the hæmorrhage continues after ligation of the common carotid artery, the wounded vessel is the vertebral artery.

Packing it must be rejected because it fails to prevent the recurrence of the hæmorrhage. Furthermore, packing is very painful, and favors infection. Ligation of the bleeding vessel is the only satisfactory method of treatment.

AIMÉ PAUL HEINECK.

Treatment of Goiter with the Röntgen-ray (Zur Behandlung des Kropfes mit Röntgenstrahlen.) v. EISELSBERG. *Wien. klin. Wchnschr.*, 1909, xxii, 1585.

v. Eiselsberg has operated upon three cases of goiter which some years previously had been treated with the X-ray. In all of these the only change found was a much greater difficulty in separating the muscles from the anterior surface of the tumor. v. Eiselsberg has never seen any permanent benefit from the use of X-ray in the treatment of goiter of any form, and does not employ it in his cases.

C. G. GRULEE.

The Surgery of the Thymus Gland (Chirurgie du thymus). V. VEAU. *Bulletin Societé de Pédiatrie*, 1909, p. 129.

The author has collected seven observations of ablation of the thymus. They are as follows: Rehn, cure; Koenig, cure; Purrucker, cure; Ehrhardt, cure; Rehn, cure; Koenig, improvement; Hinrichs, cure. The operative technique is simple. Longitudinal cervical incision extending from the thyroid to the sternum. Incision of the deep cervical fossa, opening of the capsule of the thymus. During expiration, the gland ascends; this facilitates its enucleation. This enucleation should be done without handling of the capsule which usually adhers to important organs: veins, pericardium, and nerves. The vessels of the thymus enter its superior pole. They are branches of the internal mammary and of the middle thyroid. They should be ligated. AIMÉ PAUL HEINECK.

Central Dislocation of the Femur with Fracture of the Acetabulum. A. E. HALSTEAD. *New York Medical Journal*, 1909, 953.

Halstead speaks of some fifty cases of this condition being on record and reports a new case. In taking up the general discussion of the subject he regards the X-ray as a very great aid in the diagnosis. The treatment must depend upon complications and as to whether the head of the femur is loose or held firmly by the acetabulum. C. G. GRULEE.

Congenital Position Anomalies of the Appendix and Congenital Predisposition to Appendicitis (Ueber angeborene Legeanomalien des Wurmfortsatzes und angeborene Disposition für Appendizitis). HEINRICH ALBRECHT. *Wein. Klin. Wchnschr.*, 1909, xxii, 1359.

Albrecht found anomalous position of the appendix in fifteen per cent of about 500 autopsies held on children under six years of age. Among the positions assumed by the appendix were practically all those regarded as pathological except the retroperitoneal variety, of which not a single case was found. The appendix was frequently found attached to the adjacent structures by peritoneal bands. All cases of possible peritonitis were excluded.

Albrecht thinks that these are congenital anomalies and expresses the opinion that at operation one of these forms of appendix malposition is frequently mistaken for a chronic appendicitis with adhesions. C. G. GRULEE.

Post-traumatic Vertebral Deformities (Déformations vertébrales post-traumatiques. Maladie de Kümmell). GRISOL. *Revue d'Orthopédie*, 1907, No. 2.

Since the work of Kummell it is known that after injuries to the spinal column deformities analogous to those of Potts' disease not uncommonly occur. The author examined a child six years of age who, as a result of hyperextension of the trunk, showed a prominence in the lumbar region with projection of the spinous process of the third lumbar vertebra. The lesion became worse in time. The X-ray showed the presence of lateral compression of the lumbar vertebra with fracture of the vertebral pedicle and of the right superior articular process.

What is the etiology of these post-traumatic vertebral deformities? For Kummell, trauma determines nutritive disturbances of the vertebra which atrophies through a compressive ulceration. Mickulicz says that the extra- and intradural hematoma infiltrates the nervous ganglia and thus determine strophic disturbances of the spongiosa of the vertebra.

The diagnosis is always difficult. Chief among the conditions to be excluded are tuberculous spondylites, chronic rheumatism, and traumatic hysteria.

AIME PAUL HEINECK.

Vertebral Diastasis (Le Diastasis Vertébral). BERTEIN AND WORMS. *Revue de Chirurgie*, 1908.

By vertebral diastasis is understood a lesion of the spinal column characterized by separation of the vertebræ with rupture, complete or nearly complete, of the ligaments. Articular displacements are absent. Owing to the almost constant presence of medullary disturbances, the condition is frequently fatal. The diastasis usually determined by forced flexion and rotation of the vertebra affects generally the fifth and sixth cervical vertebræ. There is a notable separation of the articular surfaces. The ligaments, especially the posterior ligaments, are lacerated. The spinal cord is ecchymotic, may present true apoplectic foci. The torn meninges allow the slow infiltration of blood. Hematorachis results thereform. The medullary lesions are due to elongation. Clinically, one observes paraplegia with anæsthesia and abolition of the reflexes, then respiratory and thermic disturbances in relation with the seat of the lesion. Local examination is negative. The movements of the neck are preserved. The spinous processes are not displaced. These two symptoms allow one to differentiate diastasis from fracture and from dislocation of the vertebræ.

AIMÉ PAUL HEINECK.

Fibromyomata Uteri. ELLICE MCDONALD, M. D. *Journal of Obstetrics and Gynæcology of the British Empire*, August, 1909.

McDonald gives an interesting series of tables based upon his further study of uterine fibromyomata. These tables include most of 700 cases, 280 of which were reported by the writer in 1904, the series also including 26 cases in which myomata were found at autopsy.

Character	Number	Percentage
Single	238	34
Multiple	462	66
Small	257	36·7
Medium	209	29.8
Large	234	33·5
Subserous	136	19·5
Interstitial	190	27.1
Submucous	75	10.7
Combined	299	42.7

Degenerations	Number	Percentage
Cyaline	127	18
Calcareous	65	9
Cystic	20	3
Hæmorrhagic	14	2
Necrotic	57	8
Adenomyoma	23	3
with Adenocarcinoma	20	2.9
with Carcinoma cervicis	6	0.8
Sarcoma	7	1.
with Chorioepithelioma	2	0.3
Total Malignancy	35	5

Complications	Number	Percentage
Ovarian Cysts	53	7·5
Cystic Ovaries	141	20
Ovarian Fibroma	8	1
Ovarian Carcinoma	5	0.7
Salpingitis	194	27·5
Appendicitis	148	21

Age	Number	Percentage
20–30 years	19	2.7
30–40 "	233	33
40–50 "	332	47.6
50–60 "	95	13
60–70 "	21	3

"In consideration of malignancy alone it is probable that malignant changes will result in one case in every twenty between the ages of 40 and 50, one case in every eight between the ages of 50 and 60, and one case in every four between the ages of 60 and 70."

In his summary McDonald makes the following points:

1. The menopause does not bring a cure to fibroids; on the contrary, increasing age increases the danger from these growths.

2. There is little danger of malignancy arising in fibroids before 40 years of age, after which time the danger increases with each year.

3. In view of the sarcomatous changes, carcinomatous associations, and other degenerations of uterine fibromyomata, early removal is indicated when they are of sufficient size to produce symptoms and cause the patient to seek advice. Small uncomplicated fibroids in young women do not require early treatment.

4. Thorough pathological examination should be made of all fibroids for evidence of malignancy. The tumor should be opened at the time of operation and examined for adenocarcinoma or sarcoma. Particular study should be devoted to those tumors which are necrotic, cystic, or both, as among these are found the largest proportion of malignant changes.

5. In view of the large percentage of inflammatory changes in the Fallopian tubes and appendix these should be examined at the time of operation and removed, if diseased. CAREY CULBERTSON.

The Significance of Glandular Hyperplasia and Hypertrophy of the Endometrium (Zur Bedentung der Glandulären Hyperplasie und Hypertophie des Endometriums). HIMMELHEBER. *Monatsch. f. Geburts. und Gyn.*, b. XXX, h. 2.

Contrary to the statement of Hitschman and Adler and others, that the so-called endometritis glandularis hyperplastica and hypertrophica are not pathologic but simple, physiologic conditions, produced by normal, cyclic, premenstrual changes in the mucosa of the uterus, Himmelheber derives, through very exact histologic and clinical examinations, the following conclusion:

The glands of the endometrium vary physiologically so much in form and number, depending on the menstruation, that it is often very difficult to distinguish between normal and pathologic conditions.

But next to these physiologic variations there exists a real glandular hyperplasia and hypertrophy. We are justified to diagnose it:

1. If there exists clinically an abnormal secretion *a*, with cystic formations in the glands; *b*, with a progressive process in the glands; *c*, with premenstrual formation of glands during the interval of two menstruations.

2. The presence of a great number of spindle cells and newly formed connective tissue.

3. If we find a true glandular hypertrophy and hyperplasia in connection with inflammatory conditions and residua of it in the stroma.

HELIODOR SCHILLER.

BOOK REVIEWS

SURGICAL DIAGNOSIS. By Edward Martin, M. D. Philadelphia: Lea & Febiger, 1909.

It is extremely difficult for an author to prepare a book which will meet the needs of the general practitioner, the specialist, and the student. Those volumes designed for didactic courses are hardly suitable for those who understood the principles of surgery, and consequently desire a discussion of the subject entirely different from that which appeals to the student. The volume of Martin appeals to one as a categorical discussion, and the diagnostic points which pertain to each individual pathological condition are given concisely, and in so far the book is admirably adapted for the use of the student. However, except the chapter upon the "Diseases of the Abdomen," one misses the clinical groupings that are met in ordinary practice.

These remarks are not made in the spirit of criticism but simply that the reader may understand the scope of the volume and not be disappointed when he misses this phase of surgical diagnosis which is such an excellent part of such treatises as "Albert's Diagnosis," and others.

The chapter by Weisenburg upon "Diseases of the Nervous System" is admirably written, and is a concise discussion in relation to diseases of this system.

The volume is one of nearly 800 pages, and covers the entire field of surgery. The sections upon fractures will be found to be particularly satisfactory.

A MANUAL OF OPERATIVE SURGERY. By Sir Frederick Treves, F.R.C.S., and Jonathan Hutchinson, F.R.C.S. Philadelphia and New York: Lea & Febiger, 1909.

The third edition of this classical work with a thorough revision by Jonathan Hutchinson presents an up-to-date, comprehensive work on operative surgery that has maintained a first place in surgical literature since its first issue in 1891. Jonathan Hutchinson, the reviser, says:

"The ever-growing importance of abdominal surgery rendered it advisable that the operations on the abdomen should be grouped together in the first volume. Some sections have been curtailed or omitted, such as that relating to lateral lithotomy, but most of them have been added to, and several are wholly new. A considerable number of fresh illustrations have been inserted, and a series of colored plates has been introduced to make clearer the anatomy of certain important operations. These colored plates have all been drawn specially for this edition from dissections in the museums of the Royal College of Surgeons and the London Hospital Medical College. I beg to thank the councils of those institutions for their kindness and courtesy in this matter.

"So far as present surgical experience goes I have selected for description the best methods of performing the various operations, but I have endeavored to avoid encumbering the work with foot-notes and details as to the exact forms of incision, etc., employed by many individual surgeons. Both surgery and medicine, I venture to think, have been greatly hampered in the past by the needless introduction of names.

"The sections on ovariotomy and hysterectomy have been revised by Dr. H. Russell Andrews, those referring to renal and vesical operations have been revised and extensively altered by Mr. F. S. Kidd and myself, the section dealing with operations on the rectum have been revised and largely rewritten by Mr. A. J. Walton. To those gentlemen I am sincerely grateful for their help."

By comparing this with the first and second editions, which are now out of print, it will be seen that the additions and alterations have really resulted in the formation of a new work while, as the author states, everything of permanent value in previous editions has been retained.

The work is of unusually artistic appearance, showing a high order of book making.

TUMORS OF THE KIDNEY. By Edgar Garceau, M. D. New York and London: D. Appleton & Company, 1909.

The Appleton Company should be congratulated upon this last addition to their series of monographs upon various subjects. The volume by Garceau comprises over 400 pages and discusses in a most satisfactory manner the subjects of renal, ureteral, perirenal, and adrenal tumors, and in addition, actinomycosis and echinococcus of the kidney.

The author offers a new classification of solid tumors of the renal parenchyma, which answers admirably for a discussion of the subject, and would seem to have a sound pathological basis. He has been able to use the pathological material from the surgical laboratory of the Massachusetts General Hospital, and thus has been enabled to add to the statistics from other authors a firm basis for the discussion of the subject.

Justly the author has given a considerable space to the subject of hypernephroma, which has not, up to the present time, received the attention that it should in American surgical literature. He has classified 176 cases from the literature. The discussion is ample and satisfactory.

The subjects of sarcoma and carcinoma have been relegated to second place, but it is yet entirely adequate. This holds true also of the discussion of

the embryonic tumors, as he chooses to classify them, and also the discussion of tumors of the pelvis and ureter and cysts.

A final chapter is given to the determination of the renal efficiency. For the matter of separation of the urine, the author is in favor of Luy's instrument, but discusses briefly the use of the catheterising cystoscopes and the technique of their use. The various tests for determining the functional activity of the two kidneys, the phloridzin test, cryoscopy, the methylene blue test, and Albarren's polyuria test are discussed briefly. In every way the author should be congratulated upon this addition to modern surgery, it being not so concise as to leave much desired, nor so complete as to bury the essential facts.

SURGICAL DIAGNOSIS. By Alexander Bryan Johnson, M. D. New York and London: D. Appleton & Company, 1909.

This work, which the author states embodies, to some extent, impressions gained during an experience extending over a period of twenty-five years spent in the surgical wards of three hospitals in the city of New York, viz.: Bellevue, Roosevelt, and the New York Hospital, is one that has the appearance of being laid on a broad foundation, and consisting of three good sized volumes, is unusually comprehensive.

The author states that he has attempted to treat the subject of surgical diagnosis upon fairly broad lines, and is of the opinion that the practical value of such a treatise would be increased if in addition to the description of methods of examination and the relation of signs and symptoms, there were added some pathological data of illustrative cases. In carrying out this idea he has succeeded in giving to the medical profession a book which will be at once a help to those who desire to study the subject of surgical diagnosis as well as a direct aid to physicians and surgeons in arriving at a correct diagnosis in individual cases.

In preparing the work, the author has constantly in mind the needs of the practitioner in general medicine, and it is to him especially that this work will be found valuable. He has been aided in the preparation of the work by the use of illustrations furnished by Dr. Francis S. Watson of Boston; Dr. George Woolsey, Dr. Pearce Bailey, Dr. M. A. Starr, Dr. F. T. Brown, and Dr. Frank Hartley, of New York; Dr. Harvey Cushing and Dr. Howard Kelly of Baltimore.

The books are unusually attractive, well printed, and illustrated.

The first volume contains chapters on: Wounds and Their Diseases; Diseases of the Soft Parts and of the Bones; Fractures and Dislocations; Tumors; Syphilis; the X-rays; The Head and Neck; Thorax and Breast; The Abdomen in General; The Peritoneum and Injuries of Special Abdominal Organs.

The second volume covers the following subjects: Injuries and Diseases of the Abdomen and of its Contained Viscera; The Rectum; Injuries and Diseases of the Kidneys, The Bladder, The Prostate, The Urethra, Penis, Seminal Vesicles, Scrotum, Testis and Spermatic Cord.

The third volume includes: The Spine; The Nerves; The Pelvis; The Extremities; The Appendix.

ANATOMIE CLINIQUE ET TECHNIQUE OPERATOIRE. By Professor Dr. O. Laurent. Second edition. Brussels: Etablissements Emile Bruylant; Paris: Octave Doin.

The modern development of surgery along the lines of technique and pathology has tended in a way to distract the student from the essential anatomical principles which must underlie all probable surgical procedures. This volume of Laurent is one that can be recommended to the student of surgery. It comprises nearly 1,000 pages of clearly written, concise, yet satisfactory discussions of the surgical procedures in their relation to anatomy. The first thirty-four pages, consumed by the discussion of operations in general, is well written. This is followed by a discussion of regional surgery, covering in a satisfactory manner the various surgical affections, and is discussed with the anatomy of the part constantly in mind.

The American misses some of those procedures in which we have taken particular pride and which have given us particular satisfaction, as, for instance, the Matas' operation. For the most part, however, the work is complete.

One will be particularly pleased with the chapters upon cranial topography and surgery of the nervous system, and also the osseous system. Fortunately, for the reader, the author combines his own clinical experience with a careful review of surgery and anatomy so that the work taken as a whole may be regarded as one of the best exponents of this phase of surgical literature that the profession of Europe and America has welcomed within recent years.

OBSTETRICS. By David James Evans, M. D. Second edition. Philadelphia and New York: Lea & Febiger, 1909.

This second edition of Evans' text-book is a slight amplification of the former volume. Accouchement forcé has been discussed along with the newer obstetrical operations. As those who are familiar with the book know, it deals in a concise though clear manner with the normal and pathological states met with in obstetrical practice. Although a book of text-book character, it will still be found a ready reference for the general practitioner.

PRACTICAL MEDICINE SERIES. Vol. III. Pediatrics and Orthopedics. By I. A. Abt, M. D., and J. Ridlon, A. M., M. D. Chicago: The Year Book Publishers, 1909.

This small volume contains a very complete review of all the important work done in the two subjects mentioned. The orthopedic section contains long abstracts of articles on congenital dislocation of the hip and tendon transplantation, as well as a review of the literature on fractures. C. G. GRULEE.

SURGERY, GYNECOLOGY AND OBSTETRICS

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CHRONIC OSTEOMYELITIS, DIAGNOSIS AND TREATMENT[1]

BY CARL BECK, M. D., CHICAGO, ILLINOIS

THIS pathologic condition comprises all those inflammations of bone which have lasted for some time. The term osteo-periostitis is used less because the conditions rarely exist without simultaneous osteomyelitis. The cause of this inflammation is, in most instances, due to an infection with some kind of a micro-organism, or several micro-organisms at the same time. Predisposing, but not necessarily existing, is an injury, particularly an injury with a great deal of destruction or laceration.

If we look over the histories of many cases of osteomyelitis we find as a rule that they have started insidiously, often manifesting the symptoms of typhoid, malaria, or other ill-defined fever diseases. In some instances a sore throat has been the starting point of this disease. Among the micro-organisms which cause the greatest destructions are the common pus microbes, and those of tuberculosis; but any other micro-organism, like the germ of pneumonia, typhoid, scarlet fever, measles, and others, may be the cause.

The invasion of the bone by the germs leads to an infiltration of the periosteum, or the spongious portion of the bone, to a blocking of circulation, and gradually to the death of cells to a smaller or larger extent. After necrosis has occurred a reactive inflammation tries to eliminate the dead tissue, by crumbling or softening, which means the formation of an abscess. Granulation tissue forms often in slow and not very virulent infections, imbedding the dead tissue like a foreign body, and in that manner cavities filled with granulations and dead bone and abscesses are formed. At times the pressure of the pus breaks such barriers as the bone may offer, forming a fistula towards the outside. In rare instances the pus may break through into a neighboring joint, and infect it. One of the most common occurrences, however, is that new bone is formed by the deposit of chalk, within this granulation tissue, or by growing from the periosteum around dead pieces of bone, so that occasionally an entirely new bony case is formed of the shape of the old one, closing within its walls the dead bone or sequestrum.

The *symptoms* of this disease are local and general. The local symptoms consist in a swelling (œdema) of the soft parts surrounding the bone, and often an abscess within these tissues. The general symptoms are those of a local septic infection, namely, fever and pain, and an impaired function.

Prognosis. If left alone, such chronic cases remain the long, tedious suppuiraton, sometimes, however, with relative good health of the patient. Very seldom do they cause grave symptoms, unless the flow of pus is blocked in some way. If properly treated most of them heal out with good function of the limbs.

I shall confine my remarks to the subject of chronic suppurative osteomyelitis, with bone sequestration, and exclude tubercular and syphilitic osteomyelitis. This will narrow

[1] Read before the Chicago Surgical Society, December 7, 1909.

Case 1. After operation; wound kept widely open after removal of gauze packing.
Below: Sequestra removed from humerus.

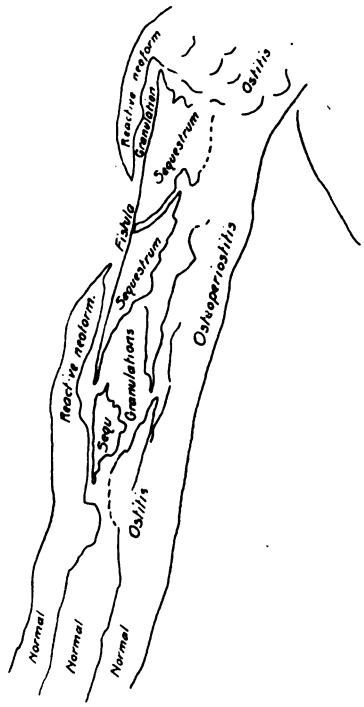
the field down to a class of cases well known to the surgeon. It comprises a large number of chronic invalids, who are afflicted with solitary or multiple foci of chronic inflammation of bone, usually the long bones with suppuration. These patients are operated upon usually more than once, and very often after one or more unsuccessful attempts to heal their bone lesions, either left to their fate uncured, or their lesions heal spontaneously after long time. They are often not sick enough to be confined to bed or to the hospital, and becoming weary of surgical treatment dress their wounds themselves and take their fate with resignation. Unless their fistulæ become temporarily blocked up they do not suffer much pain. The only inconvenience they suffer is the constant discharge of pus and the necessity of dressing. It has been our luck to observe a large number of this class, especially during the past few years, and we have paid a good deal of attention to this pathologic condition. Contrary to my former dislike of these cases on account of their stubbornness, I become more fond of their care the more difficulties they offer, and to this fact I owe the observation of a larger number, probably, than fall to the lot of most of the surgeons.

I have observed that most of these cases have about the following experience: At first their trouble is not recognized for a longer period. They are regarded as rheumatism, malaria, or other ill-defined diseases until the localization becomes clearly confined to a limb, and an abscess appears on the surface. This opens spontaneously or is lanced, not by a surgeon, but in the majority of instances by a general practitioner. With the opening of the abscess the subjective symptoms are greatly diminished, and a treatment with dressing and washing begins. This does not heal the abscess and the surgeon is consulted. In most instances he recognizes the bone lesion, and sounding and scraping begins. This is followed by one or more so-called radical operations. The more progressive and scientific men make an extensive operation, remove particles or larger sequestra, pack the cavity with gauze and expect cure, which really follows in some cases. In most instances, however, the cure lasts too long, the patient disappears from their observations, and since he is practically without symptoms, except the pus discharge, he goes on untreated. In many cases healing occurs even after a long period, sometimes with the discharge of a few spicula of bone. But in the majority of our observations the cases remain with one or more fistulæ, and in this condition they come to our care. I must say that I have among my cases some who have been treated by the very best surgeons of this country and Europe, operated on more than once without success. For a long time my experience has been the same, and in some cases I am still unable to produce a cure, but I have cured cases in which others failed, and this led me to try to find out the cause of these failures in the individual cases. In most of them I have been able to find it.

It is the object of this paper and this demonstration to show on a number of selected cases these conditions, and to analyze them. Before doing so I must discuss some of the pathologic features of chronic suppurative osteomyelitis. The cause of this condition as said before, is an

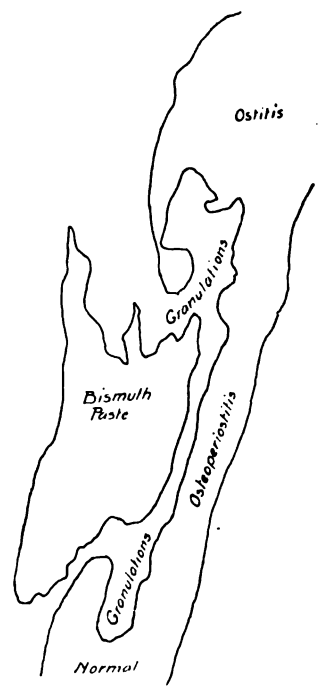
Case 1. Before operation; indicates neoformation of bone, several sequestra, and granulation around the same.

infection with strepto- and staphylococci, or other micro-organisms. The inflammation following an invasion of these germs leads as in every other locality to a melting process of the tissues, to the formation of an abscess. In the bone the abscess leads quicker to a local necrosis than in any other locality or structure, on account of the lack of elasticity of the tissue. Smaller or larger parts of the bone are deprived of their nutrition, and die. These necrotic parts are gradually, often after a long period, entirely loosened from the surrounding living tissue, and lying within a cavity of pus or within granulations, they remain foreign bodies. Like anywhere else the living tissue around these sequestra answers by the formation of a reactive sclerosis, which is corresponding in its value to the abscess membrane in soft tissues. This sclerosis within the bone is what I wish to call your attention to, because it is very important for the diagnosis and for the course of treatment of this condition. Like any other abscess, the bone abscess is either self-limited, and gradually becoming sterile, so that the sequestrum lies within a sterile cavity and it may heal in or rather never bother its possessor; or the abscess may dissolve the wall, break

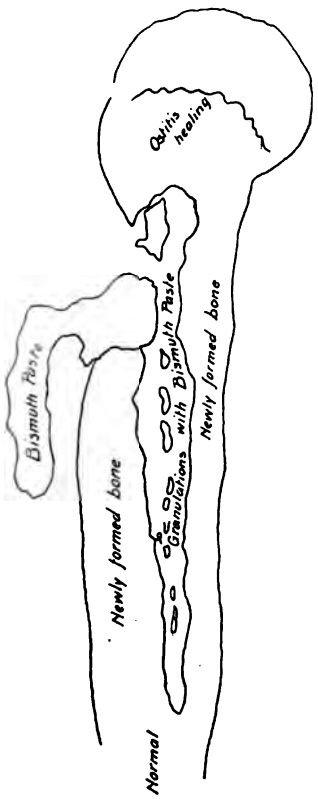


Case 1. Injection of bismuth paste, showing that all sequestra have been removed.

through it, and empty its contents outward, through a fistula, then it may close. The third and most common possibility is that the reactive inflammation leads to new formation of bone, with the thickening and gradually harder bone around the old and dead one, with one or more safety valves or openings, through which the pus keeps coming permanently, until the sequestrum is broken up into shreds by leucocytes and these shreds or spicula are discharged. This procedure is so common in this pathologic condition that it has become a pathognomonic symptom. A probe entering through one of these openings will strike rough bone, and thus the diagnosis is established. But the diagnosis is not always as easy as this, the probe might not strike the bone, and may not even be able to enter into the bone cavity. A most valuable aid in the diagnosis came to us through the X-ray. It made the structure of the bone visible, and conditions of the same were revealed which would have been otherwise absolutely hidden, and never diagnosed. Unfortunately not a proper use is made as yet of this method, and many surgeons and radiologists are still of the opinion that the diagnosis of an abscess or sequestrum in the bone by the rays is impossible. For the average observer this is true, but careful study and particularly the systematic examination of the cases in a manner which I shall describe hereafter has satisfied me that such a diagnosis

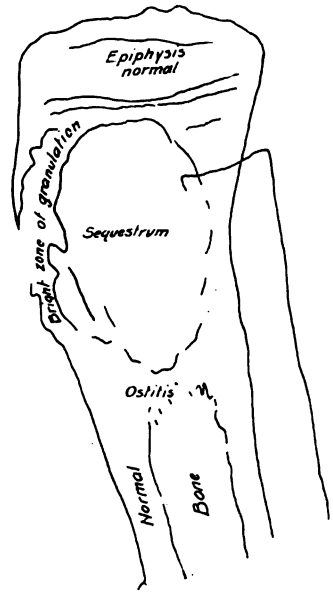


can be made with great accuracy. I have added a new method of diagnosis of these conditions by the diagnostic injection of bismuth paste, which penetrates the fistulæ and often outlines the cavities with great clearness. But inasmuch as the paste cannot dislodge blood and granulations it is not an absolute outline, and will not aid as much in the understanding of the condition as when compared with the uninjected picture. The injection of this mass is invaluable, and has led us to find the origin and the focus in many a case which would otherwise have been hidden. A striking example of its value was given to me while abroad last year. I attended the clinic of a celebrated European surgeon, to whom I just had explained the diagnostic value of these injections. He seemed to give little credence to it. By a peculiar chance or rather by the manipulation of his assistant, who took very kindly to that proposition, a case was brought into the clinic the same morning, of a fistula opening on the lateral surface of the femur. The professor explained to his audience, mostly post-



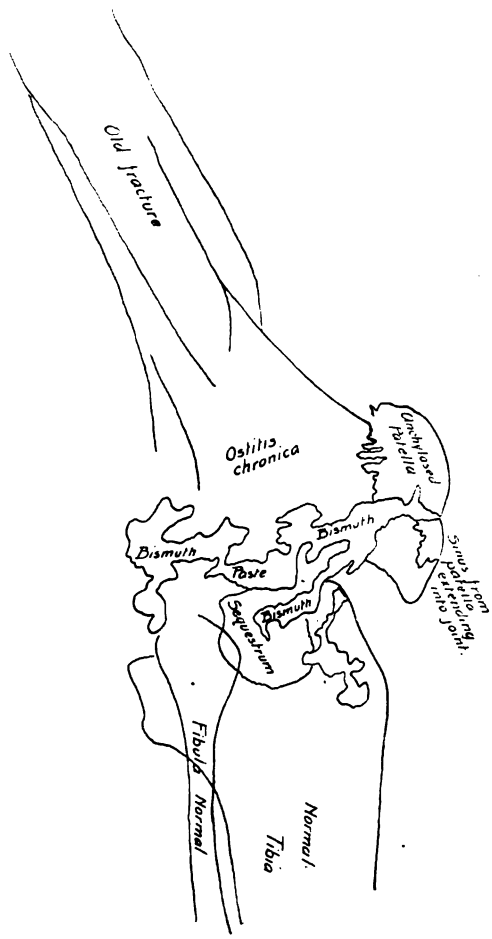
Case 1. Shortly before closure of fistula. Within the bone is some paste, in place of sequestra, enclosed in healthy granulations.

Case 2. Large sequestrum in the upper part of the tibia, below epiphyseal line.



graduates, that the fistula led to a focus of osteomyelitis of the femur, and exhibited a very good X-ray picture, which showed some mottled condition of the bone near the trochanter major. He began his operation by dissecting the fistula, but the tract led high up towards the anterior surface of the bone and did not seem to go in the direction suspected by him, and after working for over one hour and chiseling away some apparently healthy bone, he abandoned the case. His assistant injected the tract afterwards, at my suggestion, and we saw it go up to the appendical region. I heard afterwards that the professor is using the diagnostic injection ever since.

If not properly done this injection will mislead rather than help, as I may be able to show you in some pictures. The proper way of diagnosing a case of suppurative osteomyelitis is to take several pictures in a certain rotation and study them carefully. It is the greatest mistake made as yet that very few surgeons diagnose their own radiographs, but rather leave it to a special radiologist. One does not need to take the picture himself, but the radiologist has hardly ever clinical experience enough to judge pathologic conditions, and if the surgeon has no radiologic experience he is often better off without a skiagram than with one that is misleading. I am sorry to say, however, that such is the rule of our practice, that the surgeons leave it to the radiologist without clinical experience to take a picture in any manner he himself sees fit. The only way to diagnose an osteomyelitis with a sequestrum is the following: First, take a picture of the region supposed to be pathologically changed. It may not be the seat of the trouble, but it will lead the way in diagnosis. This picture has to be studied, and often will give to the experienced observer the diagnosis. Second, a picture is taken with an injection of bismuth paste, preferably stereoscopic, and it will yield usually a clear diagnosis. If something peculiar or unexpected has been found in the first picture that does not fit exactly our idea of the pathologic change present, we take a second control picture without bismuth, to satisfy ourselves whether that peculiarity is not



Case 2. Complicated fistula tract with one sequestrum left behind after first operation.

technical impurity or accident. A sequestrum can be readily made out, and often more than one, and their relation can be ascertained in stereoscopic views. It appears as dark shadow with more or less clear outlines, surrounded by a halo of clear tissue. This clear halo is apparently due to the permeability of granulation tissue to the rays. Then again, a darker outline of a shadow indicating the sclerotic reactive ostitic shell.

After an operation has been performed, and the sequestra have been removed, the cavities are transformed into healthy cavities, and then another injection is made. This gives to us a control picture, showing whether everything pathologic has been removed. This injection has been used by us also as a treatment, as we have found by experience what others have ingeniously found before (Senn and Mosetig-Moorhof,) who have tried bone chips and the "Plombe" to obliterate such cavities, and what the dentists use by plugging carious teeth with gold or other material. Bone cavities cannot be obliterated unless they have one of the most important requisites of wound-healing, namely, the coaptation of the wounded surfaces, even if it were only by granulations. If the wound borders cannot reach each other the cavity will keep on suppurating forever.

The treatment, however, of chronic osteomyelitis with suppuration is purely surgical. As I have stated before, the pathologic changes lead to sequestrum formation. In rare instances a spontaneous cure may result. But in most instances the fistula which forms spontaneously or by lancing of an abscess will result, and here only a radical operation can

Case 2. Injections of paste into the cavity left by removal of sequestrum after second operation.

come into question. Such an operation, however, should not be undertaken unless by a series of X-ray pictures the extent of the lesion has been clearly diagnosed. As I can demonstrate on a number of cases, the diagnosis is possible, and has been verified by us in almost every instance. We must admit that we have learned only recently how to go about it to make such an operation radical enough, and since that time our results have been better. While we formerly had cases, and still have some in which a healing does not take place in a short time, say four to six weeks, the failures become less frequent with our improved technique. This technique and the after treatment I can touch upon briefly, speaking to surgeons. We use Esmarch's constriction wherever we can, make broad and long incisions, and openings into the bone with "fraise" or chisel. When transforming the granulating cavity into a clean one, eventually we remove by subperiosteal resection large pieces of bone. The periosteum forms new bone. How much bone can be re-formed I can show you in one case in which a surgeon removed the whole lower jaw, but fortunately left the periosteum. The entire lower jaw has formed anew, of course in a much smaller size, because he omitted to introduce a prothesis.

I shall not discuss the different incisions which we have changed from our new experiences. So, for instance, we do not incise the femur on the side any more, but in front. In all our last cases this has proven a great deal more beneficial to make a radical operation, and to get a better cure in shorter time.

The main object of this paper was to show the necessity of correct diagnosis by systematic X-ray examination, and the absolute necessity of radical operation if we want to obtain results. Diagnosis without radical operation I can show you on these pictures, without removal of the sequestra, will never result in a cure. Radical operation, on the other hand, as I can show you also in some cases, without a correct diagnosis, will do more harm than good. For instance, if a surgeon removes three-quarters of the femur, as in one of these cases I am showing you, it is radical enough, but our picture shows that the trouble lies in the pelvis. Also, if a surgeon removes the whole jaw, and nine-tenths of it is normal, it is radical enough; but if he does not put in a prothesis or does not prevent the periosteum from shrinking, the case will be very disastrous. Correct diagnosis and radical operation must go together.

From the large number of cases demonstrated I shall select for this publication only three, which seem to me most illustrative for the point of diagnosis made within this paper.

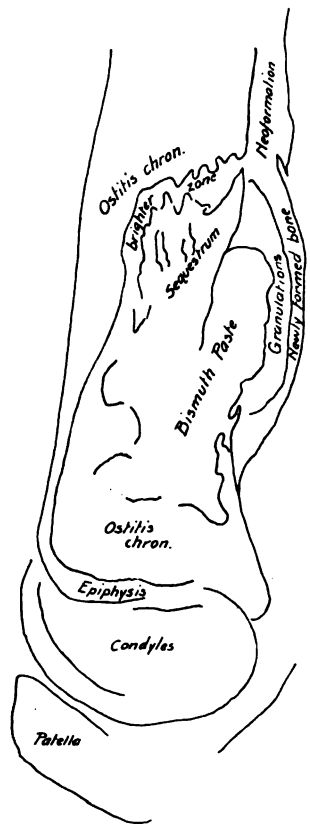
Case 1. G. W., a boy of thirteen, with chronic osteomyelitis of his humerus, was brought to me for operation. He had been suffering for over one year with his trouble, namely, a running fistula of his arm, which had been operated on twice, without success. The examination showed very much thickened bone of some irregular contour extending from the head of the humerus down to about the middle of the arm. On the outer side of the arm is a fistula, within a scar, showing the entrance of the former operations. The first picture taken shows several large sequestra, imitating more or less the shape of a normal upper third of the humerus, imbedded in granulations. The skiagraphs show distinctly the darker shadows of the sequestra, the brighter zones of granulation around them, and the darker shades of newly formed bone again on the outside. The carbon prints outlined from the photographs show the exact location of these changes. The operation removes the sequestra as shown in another photograph, and corresponding in their outline exactly to the skiagraph. An injection with bismuth paste after the operation shows the extent of the cavity left

Case 4. Shows new formed bone clearly; surrounding large cavity filled with paste and a sequestrum.

by the removal of the sequestra, and filled with granulations and blood. Another picture several months after, when the whole process is healed, shows the retraction and absorption of the paste, and new formed bone, and restoration of some of the old inflamed bones to normal conditions. The case has remained healed ever since.

CASE 2. A boy, of twelve years, with a large sequestrum of the size of an egg in his tibia, has been treated for several months at the hospital, for different diseases, typhoid, malaria, sepsis, and so on. Finally a swelling appears on the front surface of the tibia. An incision is made, pus is discharged, but a fever keeps up; septic symptoms appear again, another incision is made, a drain introduced, but no picture taken. Patient is no better. At this stage writer of this is consulted. He recommends the taking of an X-ray picture. Two radiographs are taken, both demonstrating clearly the sequestrum of the size of a hen's egg in the tibia, with the same characteristic outlines of sequestrum granulation and newly formed bone, as in the first, — however the latter not marked so much, as the case is one of subacute character. A sequestrotomy is performed, and the cure follows within a few weeks.

CASE 3. Osteomyelitis, chronic, of the femur, the tibia, and chronic suppurative ankylosis of the knee-joint. Mrs. F., 48 years old, had sustained a fracture of the femur, with dislocation of the fragments several years ago, subsequently developed a slow fever and a swelling around the knee-joint, and inability to walk.



The first picture of her shows that the femur is most affected and also the patella. It appears that the patella contains some dead bone. The operation reveals an abscess, leading into the patella, and three sequestra are removed from the same. The patient is much better after this operation, particularly healing rapidly after the injection of the bismuth paste. After closure of the fistula, however, the patient keeps on suffering lower down in the neighborhood of the head of the tibia. A number of pictures are taken, and they all reveal that a sequestrum has been left behind, of the size of a hazel-nut, in the head of the tibia. A third picture after removal of this sequestrum shows the outline of the cavity taken in by this sequestrum very distinctly, by the injection of bismuth. In both these pictures the outlines of the sequestrum are so clear that they cannot be overlooked.

A fourth case is shown in another picture, in which the newly formed bone shows particularly clear, and also a sequestrum within a cavity in which it has been for some time. This sequestrum, however, was not removed, as the patient improved so much, even with the sequestrum left behind, that he refused operation.

THE VESICULÆ SEMINALES[1]

Anatomico-Surgical Study

By CHARLES E. BARNETT, M.D., Fort Wayne, Indiana

THINKING that the anatomy, from a surgical standpoint, had probably been underdone, in the study of the seminal vesicles and considering that many of our text-books were handing down opinions derived from the older works, that had been compiled before the seminal vesicles had any prominent standing in surgery — last winter, while in Vienna, the writer did more than one hundred bladder dissections with the seminal vesicles as the potential point for investigation.

Location. Just under the rectovesical fold junction of the peritoneum filling in a triangular space between the bladder and rectum whose apex corresponds to the post-prostatic fissure, lay the vesiculæ with the vasa ampullæ between (see Fig. 1). The upper two-thirds at least of the vesicula is supra trigonal.

The external superior border marks the ureter, which is anterior to it, dipping into the bladder muscularis.

The vas, considerably convoluted, is found surrounding the superior border.

The seminal vesicle with the convoluted vas surrounding its superior border along with the ampulla attached to the middle border is enveloped by a loosely connected tissue, the vesicle itself being surrounded by a thoroughly independent capsule.

Fig. 1. Shows the prostate; the seminal vesicles, with the vasa ampullæ partially dissected away. Shows the ejaculatory ducts running into the prostatic fissure. This is the normal relation of the vesicles to the prostate. (Both the vesicles in this case are pathologic.)

[1]Read before the American Urologic Association, Atlantic City, June 19, 1909, in Symposium Uro-Genital Tract.

Size. The size varies to a marked degree even in the same subject, yet they are found larger than most descriptions would indicate. So the old anatomical saying "that they are contained within the trigonal lines" is almost always disproven. The accompanying photograph (Fig. 2) shows that should this trigonal space contain only one vesicula it would be overcrowded.

The ureteral measurement from its bladder meatus to the superior external border of the vesicle where the ureter crosses was usually about two inches. So that portion of the vesicula would necessarily be extratrigonal.

This measurement refers to biological rather than pathological vesicles for the pathologic ones were more often atrophic rather than hypertrophic.

Fascia. The vesicles lay between the recto-vesical portion of the levator fascia but running

Fig. 2. Shows the vesicles from the adominal side; the peritoneum is lifted off at the recto-vesical fold. You see the sigmoid coming down from behind. In front the "chopped off" bladder is seen showing the prostatic urethra in the center; sounds passed up ureteral openings outline a reversed trigon which illustrates the difference between the size of the trigonal space and the size of the vesicle. The dissecting forceps pass down through the post-prostatic fissure and emerge through the sinus pocularis into the membranous urethra, demonstrating one vulnerable way up to the vesicles.

Fig. 3. Shows the vesicle lifted out from just under the peritoneum, showing the vesicle and convoluted vas pressed away by tissue forceps in order to demonstrate more clearly the post-vesicular fold of fascia, whose free edge is shown just to the right of the vesicle. The fascia is pulled taut by a thread above and a hæmostatic forceps hanging from below.

from the prostatic fascia is a distinct post-vesicular fold of fascia that extends almost to the outer border of the vesicle. The outer border of this vesicular fascia is quite free and can be easily lifted from the vesicle. (Fig. 3.) A knowledge of this fascial fold would lead the operator to the vesicle around the posterior border of the prostate, when operating perineally and would protect the rectum from puncture when the operator's finger was on the vesicular side when operating from above. On the bladder side the fascia is not well marked and more caution must be used against puncture.

Vascular pole. The vesicle can be enucleated down to the ejaculatory duct and away from the vas ampulla except at the superior external pole; there the vessels and connective tissue concentrate and that portion must needs be ligated off before the vesicle can be removed. (Fig. 4.)

This vascular pole is also connected with the ureter which marks the ureteral cross (X) at this point with the vesicle and vas deferens.

Fig. 4. Shows the recto-vesical peritoneum lifted, with the vesicles looking towards the bladder, with either vas deferens running into the post-prostatic fissure from above. The right vesicle shows the vascular pole (superior external border) (the only non-enucleative portion). Here, at X, the vessels concentrate to the vesicle and to the ureter, producing immobilization between these points. The left vesicle is pathologic; is enclosed in an inflammatory capsule; is innucleable, and has nothing to do with this illustration.

It is the writer's opinion that this concentric vascular zone accounted for his finding one out of three subjects with one or the other, or both ureters stenosed.[1] The block was so pronounced in some cases that the dilatation of the proximal end of the ureter was readily seen going toward the kidney, in contradistinction to the stenosed, or normal, distal end toward the bladder.

With a pathological vesicle present, a stone would meet with especial resistance in passing this portion of the ureter.

It also accounts for the kinking of the ureter in extensive eccentric dilatation of the bladder (Fig. 5) whereby the pushing away of the vesicle will pull the ureter into a kink upon itself. This closure of lumen of the ureter necessarily produces hydro-ureter and hydronephrosis.

[1] A pathological vesicle was always found present in these cases.

Ejaculatory duct and utriculus masculinus.—The delicacy of these ducts dipping into the scinus pocularis easily explains how they might be blocked by inflammatory detritus. The prostatic fissure through which they pass (Fig. 2) makes a certain way, if followed, for the operator to finally find the seminal vesicles after passing through the prostate under the bladder. It is easy of penetration when operating from above and would afford a channel for drainage when the perineum was punctured or even out through the urethra.

The fallacy of medication possibilities through the scinus pocularis and ejaculatory ducts into the vesicles, can be easily understood when you look at the smallness of the lumen and delicacy of the ducts in Fig. 6, and the complete destruction of duct conformation in Fig. 7.

Inner structure of the vesicula.—The innumerable blind pouches that compose the mucous lined interior of the vesicle (which to

Fig. 5. Shows a distortion of the vesicle whereby the vesicle and vas ampulla are lifted up from the ejaculatory duct end and pulled upward and inward, pulling upon the superior external border (vascular pole), demonstrating the connection of the vesicle in this region with the ureter. The ureter should be anterior to the vesicle, and this unnatural picture is merely made to illustrate the point more lucidly.

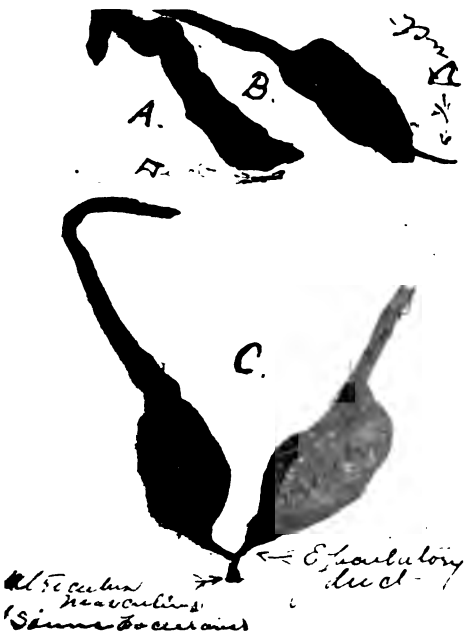


Fig. 6. Shows the delicacy of the ejaculatory ducts of the vesicles A and B. C shows the vesicles and vasa ampullæ with the perivesicular fascia intact. The ejaculatory ducts are plainly seen emptying into the utriculus masculinis (sinus pocularis).

Fig. 7. Shows five vesiculæ, two of them fused together somewhat horse-shoe shaped. Their ducts are entirely obliterated by inflammatory metamorphosis.

a certain extent is duplicated by the vas ampulla) are a misfortune to mankind on account of their easy adaptability to become retention cysts following inflammatory interference, affording no chance for drainage on account of duct block and duct obliteration.

WAYS OF ATTACK FOR THE REMOVAL OF THE SEMINAL VESICLES

Intraperitoneal.— Patient in Trendelenberg posture. Rectovesical fold of peritoneum brought up and incised. Vesicles found just beneath.

Extraperitoneal.— Midline dissection of peritoneum away from bladder. Vas deferens leads you to vesicle.

Perineal.— Prostate divided through the prostatic fissure; ejaculatory ducts and vasa ampullæ lead to vesiculæ or prostate pulled forward, by preferably Zuckerkandl screw, vesicular fascia dissected loose from posterior border and vesicle found just within.

It is not the object of this study of the seminal vesicles to stimulate any one to hazard the life of any patient by undertaking an operation which might seem easy of accomplishment, for that is not true. But it seems to the writer that the day is coming when vesiculectomy will be demanded to a greater extent than it is to-day, and in order to prepare for that time research work to-day in that region becomes a necessity.

THE USE OF OIL IN ABDOMINAL SURGERY[1]

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DURING the past twenty years the use of oil in the peritoneal cavity has on several occasions been recommended by various writers, who have brought forward different indications for its employment. Thus in the numerous records of experiments carried out with a view to finding some agent which would prevent the formation of post-operative adhesions, sterile oil is almost invariably mentioned as one of the agents tried. The intraperitoneal use of oil has also been advocated for cases of peritonitis with the object of delaying the absorption of bacteria from the peritoneal cavity. The use of this agent has not, however, received much favor among the profession generally, probably because surgeons are loath to introduce into the peritoneal cavity any foreign substance concerning the fate of which they are uncertain. Accordingly one must first ascertain whether or not there be any danger associated with the introduction of oil into the abdomen before advocating its use in abdominal surgery. The dangers which suggest themselves are oil embolism, peritoneal irritation by this foreign substance, and sepsis. With regard to oil embolism it may be at once stated that no observer has ever recorded any evidence that it does occur, at any rate in a degree sufficient to cause harm. Personally in some thirty experiments one has always carefully examined post-mortem for any evidence of this complication, but one has never detected any lesion indicating its presence.

Concerning the question of irritation or infection of the peritoneum by the oil different opinions have been expressed. Thus, Stern (1) found considerable inflammatory reaction in the peritoneal cavity of rabbits after the introduction of presumably sterile olive oil. Blake (2) on the other hand saw no evidence of peritoneal irritation after the introduction of large quantities of sterile oil into the peritoneal cavity in cats. The difficulty here consists in the fact that in order to sterilize any ordinary oil, such as olive oil, one must expose it to a temperature which causes the separation of some free fatty acid, which is undoubtedly irritative. In the first series of experiments the writer employed the purest sterile olive oil, but found that it caused considerable peritoneal irritation. After unsuccessfully trying to obtain a purely animal oil, he, at the suggestion of Mr. Alexander, chemist to the Edinburgh Royal Infirmary, tried *sterile vaseline oil*, and after extensive use of this agent, is quite satisfied that it is the best for the purpose. It is the oily liquid which comes to the surface in the preparation of vaseline, it is really a liquid paraffin, is absolutely neutral, and remains unchanged after prolonged exposure to steam under high pressure. One can confidently recommend the use of this agent in the peritoneal cavity in suitable cases as being absolutely free from danger.

THE USE OF STERILE OIL IN THE TREATMENT OF PERITONEAL ADHESIONS

The formation of adhesions after abdominal operations is a subject which has received the attention of surgeons ever since the advent of the era of abdominal surgery. The question of the prevention of such adhesions naturally has been studied most carefully, and very numerous methods have been devised with this purpose. At the present day our knowledge of the subject stands somewhat as follows: After an aseptic abdominal operation carried out without undue or rough handling of the viscera adhesions are unlikely to occur. Simple abrasion of the peritoneal surface of the viscera without infection may, but seldom does, lead to permanent adhesions. Infection of the peritoneal cavity may clear up and leave no permanent adhesions. Rough handling and abrasion of peritoneal surfaces in infected cases generally lead to the formation of adhesions, which may be permanent. In

[1] From the Laboratory of the Royal College of Physicians, Edinburgh.

several experiments on cats the writer has found that serious abrasions of considerable peritoneal surfaces may in some cases be produced without the subsequent formation of any lasting adhesions, provided no infection of the peritoneum is permitted. Even where infection was lacking, however, some degree of adhesion of the denuded surfaces was the rule.

In the human subject idiosyncrasy would seem to play a large part in determining the formation of adhesions, and an operation which in one person would cause very little peritoneal disturbance, in another gives rise to extensive adhesions, the treatment of which is notoriously unsatisfactory.

After an ordinary aseptic abdominal operation, however, there is little justification for the routine practice of introducing some foreign substance such as oil into the peritoneal cavity with a view to preventing adhesions. More practical interest centers in the question regarding what is to be done for the patient who presents himself for treatment with symptoms referable to peritoneal adhesions. Laparotomy and separation of the adhesions with the burying of raw surfaces as far as that is possible, gives as a rule only temporary relief. The introduction of foreign substances between the rawed surfaces has frequently been tried. Stern experimented with sterile vaseline, olive oil, and collodion, but found none of them to be of real value. Duschinsky (3) tried the insertion of pieces of gold beaters' skin, and Lauenstein (4) experimented with silk protective, but neither proved to be of practical value. Vogel (5) obtained some success with a mucilage of gum arabic. Busch and Bibergeil (6) in an elaborate research tested olive oil, gum arabic, paraffin, lanoline, gelatine, coragen, agar, and fibrolysin, but found none of them of any great value. They used oil in only one experiment, however, so that with regard to it their conclusions do not carry much weight. More recently Blake has recorded in this journal his experience in the use of oil in the abdomen, and is of the opinion that it does tend to prevent the formation of adhesions. Gellhorn experimented with sterilized lanoline and found that this prevented adhesions to some extent.

Numerous writers recommend pouring a saline solution into the abdomen at the conclusion of an operation as a preventive measure against adhesions, but the rapidity of absorption of this fluid makes its use of questionable value.

Relative to this part of the subject the writer has carried out six experiments on cats and rabbits. The procedure was as follows: The animal's abdomen was opened with aseptic precaution, the surface of the small intestine over about sixteen inches of its length, was scrubbed with dry gauze and scraped with a knife till bleeding points appeared. Six weeks or two months later the abdomens of the twelve animals so treated were reopened and in all adhesions were present, though they were never very extensive. These adhesions were broken down leaving raw surfaces. In six of the animals oil was then smeared over the rawed surfaces and the abdomen closed. In the control animals the adhesions were broken down but no oil used. The animals were opened again four weeks later, and it was found that in those in which oil had been used, the adhesions were very much fewer and less dense than in the controls. At the end of a month all trace of oil had disappeared from the peritoneal cavity. One has found fifteen days to be the longest time for oil to remain in macroscopic quantity in the peritoneal cavity in aseptic cases.

One concluded, therefore, that sterile oil may be advantageously used for mopping over denuded surfaces in operations for peritoneal adhesions.

THE USE OF OIL IN CASES OF ACUTE PERITONITIS TO DELAY ABSORPTION OF BACTERIA

An enormous capacity for absorption has long been recognized as a striking characteristic of the peritoneum. One need not recapitulate the results of the work done in this connection, but need only mention that as the result of researches by Wegner (7), Starling and Tubby (8), Meltzer (9), Mendel (10), Klapp (11), Orlow (12), Heidenhain (13), Durham (14), McCallum (15), Buxton and Torrey (16), and Peiser (17), we have now fairly accurate knowledge as to the process of absorption from the normal peritoneal cavity. We know that fluids and soluble substances

Fig. 1. Section of rabbit's diaphragm seven weeks after injecting oil and staphylococci into its peritoneal cavity. Note oil in phrenic lymphatics. (Sudan III.)

are absorbed in great part by the blood stream, whilst solid particles, including bacteria and such things as oil globules are absorbed by the lymphatic. We know, moreover, that the lymphatic absorption is most active on the under surface of the diaphragm and in the omentum and is very sluggish in the pelvis. Regarding the influence of peritonitis on the absorption from the peritoneal cavity, widely different results have been recorded by different observers. Schnitzler and Ewald (18) found that the absorption of potassium iodide from the peritoneal cavity was delayed in peritonitis. Clairmont and Haberer (19) found that absorption was accelerated by peritonitis, except in the very late stages of the malady, when it was slightly retarded. Glimm (20) in an elaborate research found that absorption of lactose was invariably accelerated during peritonitis, and his results appear to be of greatest value. We may take it, therefore, that the absorption of fluids and of soluble substances is increased during peritonitis.

Peiser (21) investigated the absorption of bacteria from the peritoneal cavity into the blood stream during peritonitis. He found, during the first few hours of a peritonitis, great numbers of bacteria in the blood stream, but during the course of the peritonitis as the number of bacteria increased in the peritoneal effusion, the number in the blood stream diminished, owing, he thought, to the lymphatics of the diaphragm becoming mechanically plugged by bacteria. The fibrous exudate coating the diaphragm must, however, also play a large part in retarding the absorption of bacteria.

The question now arises as to *which is the more favorable for the patient suffering from peritonitis, rapid or slow absorption?* Many writers, most prominent among whom was Lennander (22), considered that absorption of bacteria into the blood stream, by stimulating the production of antibodies, was a protective and beneficial occurrence. More recent work, however, has shown that this is not the case, and that on the contrary the more localized the infection can be kept the greater the chance for the patient. Peiser found that a certain dose of B. Coli. could be injected with impunity into the peritoneal cavity of a rabbit. The same dose could be injected into the blood

Fig. 2. Acute obstruction due to recent adhesions. Note great distention of stomach and jejunum and the collapsed ileum lying to the right of stomach. A, position of the adhesion causing obstruction.

stream of a rabbit without producing death. If, however, one half of this dose was injected into the peritoneal cavity, and an hour later the other half was injected into the blood stream, the rabbit died within a few hours with all the signs of an acute peritonitis. It would appear therefore, that as Peiser says, "Recovery from peritonitis depends on the fight between the bacteria and the body defenses being confined to the peritoneal cavity."

DOES THE INTRAPERITONEAL ADMINISTRATION OF OIL RETARD BACTERIAL ABSORPTION IN PERITONITIS?

Glimm investigated this point and as the result of his experiments concluded that the administration of oil greatly retarded bacterial absorption and favored recovery from peritonitis. He, however, injected the oil some hours before inducing the peritonitis, and as Buxton and Torrey (23) have shown, Glimm's good results were mainly due to the reactive changes set up in the peritoneum by the preliminary introduction of the oil. The writer carried out a series of twelve experiments to test the value of oil as a life saving agent when it is given at the same time as or shortly after the peritonitis is induced, this being obviously the question of most practical import.

The results of these experiments are given in tabular form below. These experiments were carried out on rabbits. The bacterium employed was staplylococcus aureus, the latter because, as the writer has elsewhere shown,[1] it induces in rabbits a purulent plastic type of peritonitis closely resembling that found in the human subject.

The purest sterile olive oil was employed, and except where otherwise noted, it was injected immediately before the introduction of the bacteria. The record of these experiments is given in tabular form (see Table 1).

From these experiments it is clear that the presence of oil in the peritoneal cavity of a rabbit with a generalized peritonitis *with no adhesions*, does not have any noteworthy beneficial action as regards the saving of life.

At the same time the results in experiments 2 and 8, seemed to indicate that the oil may have some influence in averting early death

[1] Jour. of Path. and Bact., October, 1900.

TABLE 1.

	Animal Used	Oil Injected	Bacteria Injected	Result
Exp. 1.	Rabbit 1.	2.5 cc. oil.	200 million St. Aur.	Recovery.
	Rabbit 2, control.	None.	200 million St. Aur.	Death 3 weeks later.
Exp. 2.	Rabbit 1.	3.5 cc. oil.	4,000 million St. Aur.	Death 7 weeks later.
	Rabbit 2, control.	None.	4,000 million St. Aur.	Death 16 hours after.
Exp. 3.	Rabbit 1.	3 cc. oil.	4,000 million St. Aur.	Death 14 hours after.
	Rabbit 2, control.	None.	4,000 million St. Aur.	Death 15 hours after.
Exp. 4.	Rabbit 1.	2 cc. oil.	3,000 million St. Aur.	Death 48 hours later.
	Rabbit 2, control.	None.	3,000 million St. Aur.	Death 48½ hours later.
Exp. 5.	Rabbit 1.	4 cc. oil.	2,500 million St. Aur.	Recovery.
	Rabbit 2, control.	None.	2,500 million St. Aur.	Recovery.
Exp. 6.	Rabbit 1.	4 cc. oil.	3,500 million St. Aur.	Death 23 hours after.
	Rabbit 2, control.	None.	3,500 million St. Aur.	Death 23½ hours after.
Exp. 7.	Rabbit 1.	5 cc. oil.	3,000 million St. Aur.	Death 54 hours after.
	Rabbit 2, control.	None.	3,000 million St. Aur.	Death 33 hours after.
Exp. 8.	Rabbit 1.	4 cc. oil.	4,500 million St. Aur.	Recovery but emaciat'd
	Rabbit 2, control.	None.	4,500 million St. Aur.	Death 13 hours after.
Exp. 9.	Rabbit 1.	4.5 cc. oil.	1,000 million St. Aur.	Death 9 hours later.
	Rabbit 2, control.	None.	1,000 million St. Aur.	Death 13 hours later.
Exp. 10.	Rabbit 1.	4 cc. oil.	1,500 million St. Aur.	Death 17 hours later.
	Rabbit 2, control.	None.	1,500 million St. Aur.	Death 16½ hours later.
Exp. 11.	Rabbit 1.	5 cc. oil 3 hrs. after.	1,000 million St. Aur.	Death 2 weeks later.
	Rabbit 2, control.	None.	1,000 million St. Aur.	Recovery.
Exp. 12.	Rabbit 1.	3 cc. oil 2¾ hrs. after.	2,500 million St. Aur.	Death within 15 hrs.
	Rabbit 2, control.	None.	2,500 million St. Aur.	Death within 15 hrs.

from rapid absorption, and in localizing the infection to the peritoneal cavity, and might possibly be used with advantage in e. g., fulminating cases of appendicitis.

The next question requiring solution is, *Does the presence of oil in the peritoneal effusion interfere in any way with the cellular reaction in that effusion, and does it in non-fatal cases delay the process of recovery?* By making films at intervals of a few hours from the peritoneal effusion in two rabbits with peritonitis, to one of which oil had been given, one was able to note the cellular changes. It was found that the cellular reaction was not interfered with by the oil and that the return to normal was only slightly delayed. There were one or two exceptions however (Exper. 2, 8, and 11) where the animals got over the initial danger but then gradually emaciated and in which at the end of two or more weeks on opening the abdomen, one found a cake of "cream cheese like" material which on examination was found to consist of fibrin, degenerated leucocytes, oil globules and bacteria. One cannot therefore agree with Glimm that the presence of oil never impedes but rather hastens the return to normal

in the peritoneal cavity. That the oil may, and generally does, remain for long periods in the phrenic lymphatics was made evident by microscopic sections of the diaphragms of rabbits at various intervals after the injection of the oil. In one case oil globules were still present in the phrenic lymphatics seven weeks (see Fig. 1) in another ten and a half weeks after the intraperitoneal injection.

Cultures were made from the heart blood of all the fatal cases in the above experiments, and it was interesting to find that whereas a growth of staphylococcus was obtained on five occasions from the blood of the control animals which got no oil, on only one occasion was a similar growth got from the blood of the animals which had received an injection of oil. As the death rate among the latter animals was almost as high as among the former ones, this is but another proof that the fatal issue in cases of peritonitis is due to toxæmia and not to septicæmia, and it would appear to upset somewhat the rationale of this method of treatment.

THE USE OF OIL TO PREVENT OBSTRUCTION FROM RECENT PLASTIC ADHESIONS IN CASES OF ACUTE PERITONITIS

In many fatal cases of peritonitis, more especially those due to appendicitis, a common post-mortem finding is great distention of the small intestine, particularly of the jejunum. This is generally regarded as being the result of a toxic paresis of the bowel and that the toxic factor plays a large part in the etiology of such cases is undoubted. In many cases, however, the writer is convinced that a definite obstructive cause is present, and that this cause is the binding together by recent plastic adhesions of some of the coils of small intestine and usually of the coils of the ileum to each other, to the cæcum, or to some abraded area of the parietal peritoneum. At the upper limit of the adhesion some difficulty is offered to onward peristalsis, distention of the immediately proximal loop occurs and a kink forms.

One has had the opportunity during the past year to observe the course of five such cases. In all of these an operation was performed for peritonitis following appendicitis, and in each case the patient died some days later with vomiting and great abdominal distention. At the post-mortem great distention of the jejunum and upper part of the ileum was found, whilst the lower coils of ileum were collapsed and empty and between these two segments, some coils of ileum were found, bound by recent adhesions to each other, to the cæcum or to the pelvic wall. In such cases were the distention of a paralytic nature it would affect the entire small intestine and not only the upper part, leaving the lower part collapsed. Moreover if an enterostomy be made, in a distended loop in such a case, sufficiently early, it is not uncommon to see active peristalsis in the distended bowel, suggesting a distal obstruction and not a paresis or paralysis of the entire gut.

That a recent plastic adhesion is sufficient to cause definite intestinal obstruction one has succeeded in proving experimentally, and though the peristaltic power of the normal intestine would probably overcome such an obstruction, that of a bowel weakened by toxæmia is frequently inadequate. A minimum of handling of inflamed bowel at operations for peritonitis is now a generally recognized maxim, but when such handling must be practiced, as it sometimes must, the mopping of such handled surfaces with sterile oil in order to prevent subsequent adhesion, is a procedure which I believe is more than justified by the results of the experiments described below.

The two factors which one wished to introduce into these experiments were, firstly, abrasion of the peritoneum, and secondly, bacterial infection, the latter being of a mild nature and not of itself sufficient to endanger the animal's life. The procedure was as follows: Under ether anæsthesia the abdomen of a rabbit was opened, its appendix was amputated, and the stump invaginated. The cæcum and some inches of the ileum were scrubbed with a piece of dry, sterile gauze to produce an abrasion of the peritoneal coat. One or two loopfuls of an emulsion of staphylococcus aureus (from one-fiftieth to one-twentieth of the lethal intraperitoneal dose) were then introduced into the peritoneal cavity and the abdomen was closed. The same procedure was carried out on a second rabbit with this addition, that before closing the abdomen some sterile vaseline oil was poured over the intestines.

EXPERIMENT 1

Rabbit 1. Ether anæsthesia, abdomen opened, appendix amputated, cæcum and 12 inches of ileum scrubbed with dry sterile gauze. One-fiftieth of lethal dose of staphylococcus aureus suspended in saline injected into the abdomen, wound closed. The following day the animal was very dull and would not eat and it was found dead on the morning of the second day following operation.

Post-mortem. Great abdominal distention. On opening the abdomen enormously distended coils of jejunum presented. The stomach greatly distended. Cæcum and lower part of ileum collapsed and empty. On tracing the distended bowel downwards one found that it had adhered to the cæcum at one point. Here it had kinked on itself and led to complete intestinal obstruction. The adhesion was quite recent and broke down with the slightest traction. There was little free fluid in the abdomen and death was obviously due to obstruction and not to infective peritonitis.

Rabbit 2. Ether anæsthesia. Abdomen opened, appendix amputated. Cæcum and twelve inches of ileum scrubbed with dry gauze. One-fiftieth part of a lethal dose of staphylococcus aureus suspended in saline injected into peritoneal cavity. *Four cc. of sterile vaseline oil poured over the intestinal coils,* abdomen closed. The animal appeared well on the following day and made a perfect recovery. A week later under ether anæsthesia the abdomen was reopened. Free oil was still visible forming a thin film over the intestines and there were no adhesions, abdomen closed. Six weeks later the abdomen was opened a third time. No oil could now be seen and there were a few adhesions between the ileum and the cæcum.

EXPERIMENT 2

Rabbit 1. Ether anæsthesia, abdomen opened, appendix amputated, stump invaginated. Cæcum scrubbed with dry gauze till peritoneal coat roughened. Sixteen inches of the ileum similarly treated. One-twentieth part of a lethal intraperitoneal dose of staphylococcus aureus suspended in saline injected over the intestines; abdomen closed. The rabbit was very dull and would not eat on the following day and it died 44 hours after operation with a greatly distended abdomen.

Post-mortem. Great tumidity of the abdomen. On opening the peritoneal cavity a distended stomach and greatly distended coils of jejunum presented. Tracing the distended bowel downwards one came to a point where the small intestine had adhered to the cæcum. Here a kink was found to have occurred, several loops of intestine below this had also adhered to the cæcum, and the lower part of the ileum was collapsed and empty. The large intestine was more or less collapsed. There was practically no free fluid in the abdomen and but a mild degree of peritoneal inflammation. Death was obviously due to obstruction. (See Fig. 2.)

Rabbit 2. Ether anæsthesia; abdomen opened; appendix amputated, stump invaginated. The cæcum and sixteen inches of small intestine scrubbed with dry gauze and then one-twentieth part of the lethal dose of staphylococcus aureus in saline injected over the intestine. *Before closing the abdomen 5 cc. of sterile vaseline oil was poured over the intestines.*

The rabbit never appeared ill and made a prompt and complete recovery. Eighteen days later its abdomen was reopened. There were numerous adhesions of recent date. (From the ease with which they were broken down probably the adhesions were of not more than five or six days' duration.)

No trace of oil in the abdominal cavity. Three other similar experiments were carried out. In one of these both rabbits made prompt recoveries. In the other two, the rabbits which got no oil were ill for two days, but recovered, whilst those which got oil never showed any signs of abdominal trouble.

Another case of death from obstruction due to a recent adhesion occurred in a rabbit, 4 days after infection of the peritoneum, without the mechanical abrasion of the peritoneum practiced in the experiments mentioned above. From these results two facts are quite clear: Firstly, that recent plastic adhesions (even of 36 hours' duration) are capable of causing complete intestinal obstruction, and secondly, that the use of sterile oil applied over abraded peritoneal surfaces in cases of abdominal infections is of great value in preventing obstruction from recent adhesions.

There is yet another question which still awaits an answer, and that is, whether when definite obstructive symptoms appear after an operation for, say acute appendicitis, it would be advisable to freely open the abdomen, break down the adhesions and cover the separated surfaces with some oily substance to prevent further adhesion. Whether the separation of adherent surfaces, by exposing abraded areas and thus hastening the absorption of toxins, would do more harm than the obstruction was previously causing, is a question which experience alone will decide. In any case mere opening and draining the distended gut, though always doing good, seldom avails to save the patient's life in this desperate class of case.

THE USE OF OIL TO FAVOR DRAINAGE AND INTESTINAL PERISTALSIS IN CASES OF GENERALIZED PERITONITIS

When one examines the abdomen of a patient who has died, say two days after an operation for generalized peritonitis, one realizes how the property which the peritoneum pos-

sesses of forming plastic adhesions and which is so valuable in localizing infections, may when the infection becomes generalized, militate against the patient's chances of recovery. One finds in such a case that whereas at the operation, two days before, the intestines were floating in purulent exudate, at the post-mortem the coils of intestine are glued together and between them are everywhere pockets of pus. When the pus was evacuated at the operation the inflamed peritoneal surfaces came together and adhered, and the pelvic or other drains which were left in only drained a small area in their immediate vicinity. This gluing together of the intestinal coils must moreover have considerably interfered with the peristalsis of the bowel wall, weakened as it was by toxæmia. In such cases I believe we have the clearest indication of all for the use of oil in the peritoneal cavity. If at the operation, after the pus is evacuated or the abdomen washed out, oil be poured over the inflamed intestines, adhesions will be prevented, for a few days at least, the purulent exudate will find its way down to the pelvic drain and so escape, and the general lubrication will favor intestinal peristalsis.

Through the kindness of Professor Caird one has had the opportunity of practicing this method of treatment in two cases of absolutely generalized peritonitis. In the one case in which the peritonitis was due to a perforation in a partially gangrenous cæcum which had herniated through the foramen of Winslow, and in which, at the operation, considerable exposure and handling of the intestines was unavoidable, two ounces of sterile vaseline oil was poured into the abdomen at the conclusion of the operation. The patient died 36 hours later and at post-mortem the intestines were found non-adherent and covered with a thin film of oil.

In the second case where an appendix abscess had ruptured into the general peritoneal cavity and where pus and fibrin were found covering the liver and under surface of the diaphragm the same procedure was carried out at the operation. The patient recovered and it was noteworthy that she passed flatus a few hours after operation, and had none of the symptoms of intestinal paresis which one usually sees in such cases.

CONCLUSIONS

From the observations recorded above one feels justified in advocating the introduction of vaseline oil into the peritoneal cavity in the following conditions:

1. In operations for the relief of old-standing adhesions.

2. In operations for localized or diffuse peritonitis where handling of the viscera is unavoidable.

3. In operations for generalized peritonitis to favor subsequent drainage and intestinal peristalsis.

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THE FLOATING HEAD AND ELECTIVE ABDOMINAL DELIVERY

By DANIEL LONGAKER, M. D., Philadelphia, Pennsylvania

IN making a prognosis of any given case of labor our eyes should ever be open for the *floating head* and its associated *empty pelvis*. Were clearer views generally held and disseminated regarding the significance of this abnormality, we would hear much less frequently of futile attempts at forceps extraction, ill-judged efforts at version, or of mortally injured or permanently paralyzed babies.

It goes without saying that full appreciation and comprehension of the abnormal can only be *prompt and definite* where clear ideas of the normal exist. It need, therefore, not be considered superfluous to call attention to the following characteristic features of a strictly normal labor. During the last month or six weeks the fœtal ellipse adjusts itself to the uteropelvic axis and the head sinks deeply; near the end of gestation the cervix disappears or becomes canalized, and the advent of labor pains effects rapid dilation. By conjoined examination weeks before, the already engaged head is readily farther depressed. It will be found impossible to approximate the tips of the fingers to the sacral promontory or to pass the hand beneath the head suprapubically. Should the hand easily pass into the pelvis anteriorly and from above, without encountering any definite resistance, we may have a floating head; or the true pelvis may be unoccupied because the pelvic fœtal extremity is in relation with the pelvic canal. It is usually easy to differentiate between the two, but occasionally a mistake will be made.

My object in speaking of the *floating* head as a distinct entity is to enable me to call attention to its significance from the point of view of prognosis. When this is duly appreciated most reliable and positive indications for treatment can be deduced.

Certain dangers attending the course and conduct of labors thus complicated demand especial emphasis, and these threaten both the mother and her child.

With regard to the first point: Where the end of gestation is reached and the head remains above the inlet, we have a most important indication of disproportion, and this is especially true in the primiparous. The existence and the degree of disproportion ought to be made out at the earliest moment, about the thirty-fourth week of gestation.

The influence of the high position of the head is far reaching, and in many of these cases we may look for a very slow first stage; a protracted gestation may be due to the same cause, the influence of the high situation of the head forming a vicious circle. They are likely to go into labor without the usual physiologic development of the lower uterine segment. There is evident a lack of proper development in the non-appearance of the normal canalization of the cervix and the immediately superjacent parts. If these facts be admitted, the utility of certain expedients to overcome disproportion may very properly be questioned. If it can be shown that cervical dilation under certain circumstances is attended by serious danger, such operations as pubiotomy and symphyseotomy must fail for the reason that complete preparation of the canal is a prerequisite.

Bearing on this point I shall briefly refer to three cases of rupture of the uterus under these very conditions. The first of these was in labor with her ninth child, all of the previous labors having been difficult. The dilating stage lasted all night, and had been imperfectly accomplished, when she screamed out in great sudden pain. After this there were no more pains; the woman went into collapse, the presenting head disappeared, the child floating free in the abdominal cavity. The patient died undelivered about two hours after the accident.

The second case was one in which delivery had failed after forceps and version in the hands of two capable physicians. I was called on to do a craniotomy. The patient on my arrival did not present a particularly bad appearance, and there was no difficulty about the operation, the perforated head being extracted by the Braun cranioclast without any undue effort. Immediately following the delivery the patient

went into collapse; there was marked air-hunger and death followed very promptly. I suspected rupture of the uterus, and confirmed my suspicion by passing my hand through a laceration posteriorly. She was a primipara.

The third case occurred during the past summer. She, like the preceding woman, was a primipara who had a very slow first stage. The dilation finally advanced to a point at which it was deemed advisable to use forceps. There was a history of instruments slipping, and in evidence of this there was such extensive laceration of the perineum and rectovaginal septum that packing was resorted to in order to control hæmorrhage. At this time the head was still floating, proved on my arrival by slipping one hand beneath it between the head and the pubic bone. The patient under moderate anæsthesia, my assistant firmly held the head at the brim while I adjusted the blades as near as possible to the sides of the head, and as I made traction he exerted forcible pressure in the axis of the inlet. Without any undue effort we were able to deliver a nine pound girl, which lived and which has done well, being exclusively bottle fed. I was about to leave when the attending physician called my attention to a loop of small bowel protruding from the vagina. It had come into view as he was attempting to expel the placenta. She was washed off, padded, and hurried to hospital by ambulance. Here the placental stage was completed and then her abdomen was opened. While in the Trendelenburg posture all bowel was carefully drawn up out of the pelvis from behind the uterus and inspected. Some ecchymotic spots in the mesentery near the bowel attachment were the only injury that could be found. The rupture of the uterus was not definitely located. Her perineal lesion was cured by subcutaneous repair at the end of three weeks, when the wound had become quite clean, and the woman left the hospital at the end of five weeks, well on the way to recovery.

In many of these cases of non-descent from slight narrowing, and especially where the contraction is of the anteroposterior diameter only, I do version with much satisfaction. I have never had any accident, and during later years I have good results so far as the delivery of living babies is concerned.

But the adoption of version is conditioned on the existence of a slight degree of disproportion. This is difficult to express in figures, if not impossible, and it must be decided by the judgment of the operator in each individual case. I find myself in accord with Williams, who says (Obstetrics, p. 399, 2d Ed.): "The head floating above the superior strait, delivery is best effected by podalic version, provided no serious disproportion exists." Also: "Forceps on the floating head is a most serious procedure, rarely to be undertaken." (The first portion of this teaching I find contradicted in an earlier part of the volume quoted.) More of this later.

Having established the existence of serious disproportion, if necessary under ether, what shall be done? If we wait a sufficient length of time a certain proportion of these cases will so mould the head that it will find its way into the pelvic excavation, where it may be safely within the reach of forceps. It is in advocacy of this, the expectant plan, that I find the contradiction just spoken of. This is always a slow process, frequently requiring several days; as we have seen, it means a certain risk of rupture of the uterus. There is a mortality and a definite morbidity depending on the circumstances attendant on the given case, infection being certain under the influence of frequent internal examination. Every one who has done consultation work can bring his quota of cases with bad results. I have just seen the mother of two babies delivered dead under these circumstances; following her second delivery she was one year in convalescing. It required all this time, with electricity and massage, to restore her health.

If figures are required, a most interesting array has been furnished by J. D. Voorhees in the Am. Journal of Obstetrics for August, 1905. See also article by De Lee (Pract. Med. Series: Obstetrics for 1906, p. 180):

If disproportion be recognized as early as the thirty-fourth week an opportunity will be allowed to consider induction of labor, and I am of the view that a small percentage of cases is quite suitable for this operation. Here as

in so many other situations obstetric, every case must be a law unto itself. In the case reported by my friend, Dr. Astley, I was in full accord with him in not considering it, and in favoring abdominal delivery as the operation of election. He could report a number of cases in which the results of induced labor proved keenly disappointing. The mothers made a uniformly good convalescence, but fœtal mortality was about one hundred per cent.

I am also willing to admit that symphyseotomy or pubiotomy may be successfully employed, but I am firmly of the opinion that the field here ought to be limited, and for the reasons already given.

There remains therefore to be considered abdominal delivery as the operation of choice in the cases which present such a degree of disproportion as is beyond the reach of prophylactic version or of expectancy and forceps. I have purposely refrained from giving the figures, the precise measurements of the pelvis that indicate this or that operation. I believe dependence on pelvimetry alone is a method calculated to lead to delusive and erroneous conclusions. I have not gone into its details, in order that I might focus attention on the head. In a given case the results that may be gained by an accurate fitting of the head to the pelvis exceed in value those of all other methods combined.

Clearly in the past we have paid too little attention to the childless mothers; we have underestimated the possibilities and the probabilities of idiocy and the paretic conditions incident to mechanical difficulties at birth; we have constantly turned a deaf ear to the wails of many women during parturition complicated by disproportion between the head and the pelvic canal.

Why should obstetrics lag behind the other special branches of surgery? The time was when gall-stone disease, appendicitis, and many affections now recognized as essentially surgical, were treated by methods purely medical. And quite a few of the cases so treated got entirely well. The argument for expectancy where the head floats because of disproportion is precisely on the same basis. From sixty to seventy-five or eighty per cent of the babies survive the dangers, and only a few mothers actually die.

We want the man in general practice to view these cases from our standpoint, which is diametrically opposed to his in this respect. Knowing that the great majority of cases will deliver themselves normally, he accepts the exceptional case on faith, trusting that somehow all will end well. The obstetric surgeon on the other hand approaches every case as a possible subject of complication, keenly alive to every danger threatening either mother or child. If he would obviate these dangers and approach somewhere near his ideal, he will choose the abdominal route of delivery with increasing frequency.

In the recent past I have done three purely elective Cæsarean sections, saving all the babies and all the mothers. My entire list includes two others besides these, neither of which was elective. In one the pelvis was obstructed by an immovable fibroid, and the woman had been in ineffectual labor for many hours; both she and the baby lived. This was a case in the practice of the late Dr. Frank Swartzlander of Doylestown, occurring about nineteen years ago. The other one was a greatly delayed obstructed labor in the practice of a very old Philadelphian, who enjoyed quite a large obstetric practice in his day, but who had never used forceps or done a single obstetric operation more serious than tying the umbilical cord. Her labor had been delayed many hours, the head being jammed at the superior strait. I attempted to deliver instrumentally, but broke the forceps in the second traction effort. Most of the blade remained in the uterus and beyond the reach of my fingers. I was unwilling to proceed with delivery by the pelvic route, hurriedly secured the assistance of two friends in the vicinity, did a section, extracting a living baby. It lived and did well, but the woman died of peritonitis at the end of forty hours.

The net results of my cases are all of the five babies saved, and four of the five mothers.

In conclusion, whenever a "floating head" persists until the advent of labor, difficulty, delay, and danger are to be feared, especially in the primiparous. Attempts to deliver by

forceps are very likely to be unsuccessful, and they are frequently followed by the most serious consequences. Version, where slight disproportion exists, may be successful; likewise expectancy, delay, and then forceps; but in many of these cases the future welfare of mother and child will be best conserved by electing delivery by the abdominal route.

INTUSSUSCEPTION IN CHILDREN[1]

By J. M. ELDER, M. D., Montreal, Canada

WHEN I was honored by the invitation of your association to read a paper at this meeting, I cast about for some subject which would be possibly of equal interest to the general practitioner and to the surgeon. The subject of intussusception in children had been forced upon my attention by a series of cases at my clinic at the Montreal General Hospital, so I have chosen this subject for my remarks to-day as one meeting the indications I have just mentioned. I have no hope that I shall say anything startlingly new, but by drawing attention to certain facts, figures, and opinions, I trust I may stimulate discussion by the members in general.

Cheyne and Burghard[2] make the statement that "acute intestinal obstruction in infants, if external hernia be excluded, is practically always due to intussusception." The statistics of other observers bear out this, at first sight, rather dogmatic statement; moreover, the onset of this condition is often insidious, and the results of treatment are so vitiated by any delay in arriving at a correct diagnosis that it is of the utmost importance to all concerned that no symptoms should be neglected and no method of arriving at a speedy conclusion in regard to the condition present should be overlooked by the general practitioner, who naturally sees the initiation of a majority of these cases. Osler says, "It is of all forms of intestinal obstruction the one most readily diagnosed." The experience of hospital surgeons, who so frequently see neglected cases sent in by general practitioners, runs somewhat counter to this statement of the master.

[2] Cheyne and Burghard's Surgery, vol. vi.

ETIOLOGY

As regards the etiology of the affection, it would seem to be due to a localized paresis of some parts of the intestinal tract, associated with increased peristalsis in a neighboring part. This unequal peristalsis is a notable feature of many abdominal affections in infants, and hence the proneness of these patients to intussusception. For this reason we find it often associated with diarrhœas and intestinal indigestion, especially in weak, ill-nourished infants. Jumping the child up and down on the knee has often been credited with causing the trouble, and so has straining at stool in cases of chronic constipation. Four to six months is the most common age and 75 per cent of the cases reported have been males. Observers who have seen cases recur at the time of operation, state that the upper end of the bowel (intersusceptum) is not pushed into the lower, but that the lower (intussuscipiens) creeps up over — "swallows" as Sir Watson Cheyne puts it — the upper. This process (as Nothnagel well points out) is analogous to, and only an exaggeration of, the normal method by which the valvulæ conniventes of the colon reach up and bring down the fæces towards the rectum. Bearing this in mind, one can easily understand how any tumor of the bowel would predispose to its being intussuscepted into the section below. This, too, explains those cases of double intussusception which I shall refer to later (case 2).

VARIETIES OF INTUSSUSCEPTION

(*A*) ANATOMICAL

1. *Ileo-cæcal.* von Bergmann says that 70 per cent of all cases of infantile intussusception are of this variety. Here the ileum is

[1] Read before the Surgical Section of the Ontario Medical Association, Toronto, June, 1909.

invaginated into the cæcum, but *not through the ileo-cæcal valve*, which always remains the apex of the intussusceptum. It follows that part of the invaginated portion will be ileum and part colon, and that at times the valve, with the appendix vermiformis, may even present at the anus, or protrude beyond it as shown in the drawing from life made for me from one of my cases by Dr. F. B. Gurd, my then House Surgeon (Fig. 1). There is always apparently great shortening of the colon in these cases.

2. *Ileo-colic.* Here the ileum actually invaginates itself through the valve and may push on even as far as the rectum, but all the intussusceptum will be ileum and the colon will be of normal length and in normal position, and so will the appendix vermiformis. This variety is rare but I remember seeing such a case in Dr. Shepherd's clinic about 18 years ago.

3. *Colic.* Here one part of the colon telescopes another — usually the descending colon into the sigmoid. This constitutes 18 per cent of all cases, and is, par excellence, the form of intussusception met with in old people, especially if any malignant growth be present as a predisposing cause.

4. *Enteric.* An intussusception of the small bowel into small bowel. This is extremely rare and I have never seen a case.

(*B*) CLINICAL

All intussusceptions are either acute or chronic. There must be, one would think, always an acute stage, and yet the symptoms of it are passed over as an ordinary colic, and if the intussuscipiens dilate sufficiently to allow fæcal contents to pass through the intussusceptum, the symptoms of acute obstruction will disappear, and the condition then becomes chronic. Adhesions rapidly form between the serous surfaces of the invaginated bowel and very shortly it will be impossible to reduce the invagination. But the bowel itself cannot be invaginated without taking the mesentery in with it, and it is this pulling upon the mesenteric nerves which causes most of the pain, and which largely differentiates this form of intestinal obstruction from others. Further, the strangulation of the mesentery interferes with the blood supply of the invaginated bowel, and speedy sloughing with subsequent absorption of septic products results. It is the speedy advent of this septic condition rather than the purely obstructive phenomena which makes intussusception such a fatal accident unless speedily dealt with.

SYMPTOMS

There will usually be a history of sudden onset of rather severe colic in a child who was previously in its usual state of health; the severe pain soon ceases and the baby may appear almost well when seen by the physician. I think shock is always present at the outset but it must be very transient, and at the first visit the condition is often overlooked. Infants are so subject to colicky pains, which are usually evanescent phenomena. After the interval of a few hours, during which the baby is very restless, the pain recurs again, and is generally, now for the first time, associated with vomiting and rectal tenesmus. There may be a couple of quite normal stools (especially in the ileo-cæcal variety — not so likely in the sigmoid) but soon the continuous and distressing tenesmus is associated with the characteristic discharge of bloody mucus from the bowel. The vomiting is usually more the regurgitation of anything given by mouth than the persistent, explosive vomiting of other forms of obstruction, and is rarely fæcal.

DIAGNOSIS

It is all important that this should be made as early as possible. An enema should be at once given, and even if ineffectual it should be repeated, if the symptoms detailed above persist. The child should be stripped and a very thorough examination of the abdomen made. In most cases I would strongly *advise that this be done under light anæsthesia;* the restlessness and sensibility of the child will otherwise often prevent one from palpating the characteristic, movable, sausage-shaped tumor which is pathognomonic of this trouble (case 4). A digital rectal examination should also always be made at the same time, as sometimes a tumor may thus be felt in the pelvis.

Just a word upon the bearing of early diagnosis, and consequent prompt treatment upon

prognosis in this affection. I quote Hirschsprung's statistics as given by Rushmore[1] on this point, for two reasons: First, because of his large experience, and second, because he gets such wonderful results by non-operative methods:

"Mortality of cases treated within 12 hours of onset of disease, 6 per cent; in second 12 hours, 35 per cent; over 24 hours, 54 per cent. In 44 children under one year, 70 per cent recovered, if treated within the first 24 hours of the disease; if longer, only 30 per cent recovered and the younger the infant the more reversed will these figures be."

Our own operative statistics at the General Hospital, Montreal, are to the same effect; early treatment is all important if we are to get good results, and early treatment presupposes an early and correct diagnosis, and hence I again insist that these cases should be most closely examined and carefully *watched until intussusception can be carefully excluded* as a cause of the symptoms present.

TREATMENT

This at once raises the interesting question of spontaneous recovery from the condition. Some authorities maintain that most cases of intussusception right themselves in this way, and that we only see those which fail to do so. Undoubtedly, in some cases which have been left to nature, cures have followed as a result of the invaginated portion sloughing and coming away in the stool. But this never should be relied upon, as leakage at the site of the slough, with resulting fatal peritonitis, is much more likely to occur than a spontaneous cure. Moreover, stricture of the bowel at the site of sloughing is very likely to cause trouble later on. In the main, we may say that the treatment of any given case will fall under two categories: 1. *Non-operative;* 2. *Operative.*

1. *Non-operative* This may be in the form of taxis, massage of the tumor under an anæsthetic, or inflating the bowel by air, or fluid, associated with posture. These should always be tried, but not for long, and no undue force employed. Hirschsprung, whose large expeience makes what he says especially worthy of note, states (loc. cit.) that out of 107 cases (77 boys and 30 girls), varying in age from seven weeks to seven years, laparotomy was rarely required, since taxis under general anæsthesia usually led to a cure. Of course the results were better the sooner the treatment was instituted; but even then his recoveries vary from 65 to 75 per cent. But were they all true cases of intussusception? In spite of such a statement it is true that the result of such reduction by massage is not always good. One never knows what damaged bowel is being reduced nor how complete the reduction is, and some fatal results are recorded after this method. Moreover we are consuming very valuable time, and hence I say this should not be long persisted in, and one should practically in all cases advise operation as soon as diagnosis is made.

2. *Operative.* The abdomen should be opened directly over the tumor, if that is palpable; and a fairly free opening should be made and thus all rough handling of the bowel will be avoided. Inasmuch as young children bear anæsthetic shock badly, it is well to have all the preparation done before the anæsthesia is begun, and to operate quickly. The time consumed at an operation is a very important factor in the prognosis. The intussusception tumor should, if possible, be delivered through the abdominal opening and there dealt with. The intussusceptum should be "milked" out of the intussuscipiens, never pulled out. Here Sir Watson Cheyne's method of having an assistant give simultaneously a high enema of warm olive oil often aids, and the incarcerated bowel is thus delivered with less shock. In the four cases I have lately had I was fortunately able to reduce the bowel in all. The question of the viability of the incarcerated bowel is then determined in the same way as that of a strangulated hernia. If not viable it should be resected and some method of end to end anastomosis done; Maunsell's method is probably the best. But what if it be irreducible — so firmly adherent that it will not come away? Then I think Barker's method of treatment is best. He sutures the bowel with the Lembert stitch at the junction of intussusceptum into intussuscipiens, then opens the intussuscipiens and excises the portion of

[1] Rushmore, Annals of Surgery, August, 1907.

incarcerated gut, subsequently ligating its mesentery at the first suture line. If the patient's condition does not admit of this, excise the dead portion and bring out the two ends in the incision and close them later, using the Mikulicz clamp if thought best. To prevent recurrence of the intussusception, it is well, before closing the abdomen, to anchor the intussusceptum by a few stitches through its mesentery to the posterior layer of peritoneum, or to fasten it by suture to some neighboring bowel, e. g., ileum to ascending colon, to prevent ileo-cæcal intussusceptions.

After treatment. This is very important. Enemas should be begun early, should be never large, and should be repeated every four hours until effectual, and all food should be withheld by mouth until they prove effectual.

In conclusion, what promise of cure can we hold out in children promptly treated? Rushmore (loc. cit.) gives the following statistics:

1. As regards the *age* of the patient: During the first six months, there is a mortality of 28 per cent; during the second six months 22 per cent; the third six months 18 per cent, and after the third six months, 14 per cent.

2. As regards the *time of operation* after the incidence of the disease, we find the statistics most instructive. If operated upon within twelve hours, the recoveries will average, even in young infants, 80 per cent; after twelve hours these figures will practically be reversed. (Our statistics at the Montreal General Hospital show 75 per cent of recoveries in cases operated upon within twelve hours of the onset of trouble, and 75 per cent in those operated upon after that time.) The older the patient the better will he be able to stand delay, but here, too, it is rare to get recovery after forty-eight hours.

Chronic intussusception in itself is not a serious trouble but is one of the causes of chronic intermittent obstruction and is liable to lead to secondary acute conditions just as a malignant growth would. The treatment is always excision where possible, or a lateral anastomosis to short circuit the trouble.

Synopsis of four cases of intussusception in infants lately treated by the author at the Montreal General Hospital, and which served as the basis of this paper:

CASE 1. Baby S., aged four months; a healthy male child. Onset of illness insidious; baby was restless and did not sleep well on the night of January 22, 1906, and some slight diarrhœal stools were passed. About 3 P. M. next day he had acute colic and began to vomit, vomiting about four or five times in all. Three enemas were given in the afternoon but none were effectual and obstruction appeared complete at 7 P. M. when I saw the case. The child's condition rapidly became worse and distinct rigidity and tenderness could be made out on the left side of the abdomen. Nothing could be made out by digital examination per rectum. I should have operated at this stage, or at least examined under anæsthesia. At 12 o'clock that night enemata were still ineffectual and a sausage-shaped tumor could be felt in the left side of the abdomen, apparently about the splenic flexure, and some bloody mucus was passed with each attack of tenesmus, which was fairly often. The picture was now classical — the baby lay quietly in bed with a "wooden" expression and only at times complaining of cramp-like pains and not vomiting unless something was given it. The breathing was rapid, pulse 120, temperature 101°. It was immediately taken to the hospital and a laparotomy done. The incision was made in the median line and the collapsed sigmoid found; the colon was delivered and an ileo-cæcal intussusception exposed. This had gone as far around as the splenic flexure, into which apparently the ileum ran. It was reduced with some difficulty, the cæcum and appendix coming out last. The appendix was very blue and congested, so was removed, but the rest of the intussusceptum was apparently viable. The bowels were returned and two or three fine catgut sutures introduced between the ileum and cæcum with a view to prevent recurrence of intussusception. The baby was extremely restless all that night, apparently suffering from frequent spasms of very severe pain; it refused all nourishment and the bowels did not move; one-sixteenth of a grain of morphia did not control the pain; there was no vomiting. The bowels later began to move and the baby took the breast. Later on the next evening the child's respirations, pulse, and temperature, went up and he developed symptoms of pneumonia from which he died on the night of the 27th, with abdomen soft and bowels moving freely. Here we waited too long before operating, I think, and the child became toxic and died from septic pneumonia.

CASE 2. Baby P., aged six months, female, referred to me by Dr. Blackader. Not a very strong child, but was in usual health until 2 A. M. November 17, 1907, when it awakened crying and seemed in a good deal of pain during the remainder of the night. A dose of 02. ricini was given and the bowels moved once; no blood in the stools. She was restless and feverish all that day but was not so ill that the mother could not take her out. Next night she was worse, waking frequently and crying out with pain. Towards morning the bowels moved once, no blood in the stools. At 11

A. M. the child became suddenly worse and began vomiting and there now appeared every hour stools of bloody mucus with frequent spasms of pain. The child was admitted to the hospital at 9.30 that evening with a pulse of 120, respirations 50, and a temperature 99½°. On the left side of the abdomen, low down, was a sausage-shaped mass which could also be felt by rectum; the abdomen was distended. The child was resting quietly and operation was performed at once. An incision was made to the left of the left rectus muscle of the abdomen. The mass was delivered and it was found that the intussusception was a double one. Evidently there had been first an ileo-cæcal intussusception, which had progressed along as far as the splenic flexure, and then this whole mass had intussuscepted into the sigmoid flexure of the colon, so that it appeared as if the ileum had been transplanted into the sigmoid. The sigmoid intussusception was first "milked" out and then the ileo-cæcal similarly reduced. The incarcerated bowel after its liberation, though dark in color, was glistening and viable and under hot fomentation it speedily regained color. Two stay sutures of fine silk were placed at the ileo-cæcal angle to prevent recurrence, and the abdomen closed without drainage by through and through sutures to save time — a mistake, I think, as the sequel will show. Time of operation, thirty minutes. Post-operative pain and distress were controlled by enemas of starch containing one drop of tr. opii. Great difficulty was experienced, by enemas, in overcoming the great tympany that followed operation, and for several days it looked as though the child would not recover. Vomiting was associated with the tympany and the heart required constant hypodermic stimulation. The temperature at one time, the day after operation, reached 104½° and pyrexia continued until the sixth day after operation, then it came down to normal and the patient did well. The abdominal distention pulled out some of the sutures and a ventral hernia at the site of operation developed and is still there. This has proved that suturing in layers would have been better.

CASE 3. Baby O., aged four months, male; a small, not well developed child, a seven months' baby and artificially fed. Sent to the hospital on July 29, 1908, by Dr. Church. There was a large prolapse of the bowel, 5 cm. long, from the rectum (Fig. 1). At the end of this prolapsed opening a small opening permitted the passage of fæces at frequent intervals. There was no abdominal distention and no vomiting, though the baby appeared to be in some pain and distress; temperature 98°, pulse 164, respirations 64. This protrusion from the anus appeared suddenly at 9 A. M., without apparent cause or previous history of severe pain or obstructive symptoms. The protruded mass could only be partially reduced en masse, but the slightest strain on the part of the child brought it down again. Laparotomy was performed at 2 P. M. when an intussusception of the sigmoid was found, the intussusception protruding out through the anus. I thought it was probably an ileo-cæcal case and therefore went to the right of the mid line in my incision, but I was wrong, as it proved to be purely a sigmoid case,

Fig. 1. Case 3.

easily reduced by combined external and internal pressure. The obstruction was not complete, as gas and fæces could pass, and the incarcerated bowel was not very dark and quickly regained its normal color under hot cloths. Two fine silk sutures secured the mesentery of the sigmoid to the parietal peritoneum with a view to preventing a recurrence and the abdomen was closed as usual. The operation lasted twenty minutes in all. A rectal saline with brandy was given and the child soon recovered from the shock of the operation. Next day there was marked abdominal distention, but under enemas of turpentine and quin. bisulph., the bowels moved well and flatus disappeared. The child improved rapidly and went home on the third day, returning on the tenth day to have the sutures removed, when primary union was found to have taken place. I have since heard that the child is quite well.

CASE 4. G. C. aged eight years, male. Was at school as usual on December 11, 1908, but complained of slight diarrhœa in the afternoon. Slept well all night but awakened at 6 A. M. with sudden, violent abdominal colic referred to the left side of the abdomen. He vomited a little and was pale and weak and could not lie on the left side. The patient had two or three stools in rapid succession, the character of which was not noticed, as he had used the water closet. Paroxysmal pain continued, with nausea, but no vomiting, and I saw the lad at 11 A. M. He was lying partially dressed on a couch, the countenance was pale and anxious; no coldness or evidence of shock; the pulse was slow and somewhat intermittent, temperature 97°. Examination of the abdomen was then negative as to a mass but there was some tenderness on the left side, with diminished dullness on percussion over left hypochondriac region. Digital examination per rectum was negative. An enema of soapsuds was given and the stool ordered to be kept until my return from my office whither I went for an anæsthetic. I returned shortly, and found that the returned enema contained some bloody mucus and particles of fæcal matter. No flatus passed. Under C. E. anæsthesia, I could easily palpate a sausage-shaped movable mass in the left hypo-

chondrium and at once ordered the patient to the hospital where I operated as soon as I could obtain the consent of the father, who was absent on business.

Operation under C. E. anæsthesia was done in the left semilunar line at the level of the umbilicus and a sausage-shaped tumor of the splenic flexure of the colon delivered through the wound. The other parts of the colon were normal so this was evidently a pure colic intussusception,— the transverse colon into the splenic flexure. The invaginated bowel (five inches long) was easily reduced by pressing up from below ("milking up the tumor"), and the intussuspected portion soon regained good color under hot cloths. The intussuscipiens was markedly œdematous and showed a distinct ring at the point of invagination, simulating stricture. At this point a fine silk suture was tucked into the mesocolon, at both sides of the ring, to prevent a possible recurrence, and the abdomen closed in layers without drainage. The operation lasted twenty-five minutes. Recovery was quite uneventful and he was removed to his home in the ambulance on the fourth day after operation and was up and about in three weeks, the wound healing by primary union.

To recapitulate, four cases, all reducible, with one death from pneumonia on the second day after operation, a mortality of 25 per cent. All were fairly early cases; all were reducible, and in none was resection of the bowel needed. The post-operative hernia I attribute to the tension on the through and through sutures as a result of the great abdominal distention, and hereafter I shall close the abdomen, where possible, in layers.

I have before me the records of four other cases operated upon at the General Hospital during the period covered by the cases I here report. None of these were operated upon within twelve hours of the onset of the disease. In three of the cases resection of the injured bowel was demanded and all three died. In the other case, although operated upon fourteen hours after the incidence of the disease, resection was not needed and recovery took place.

Here we have two series of cases, four in each, operated upon during the same period of time in our Hospital, with practically the same technique and after treatment, and in those operated upon within the first twelve hours no resection of the bowel was needed and 75 per cent recovered; whereas in those operated upon after twelve hours had elapsed, three of the four cases required resection of the bowel, and only 25 per cent recovered.

PREMATURE DETACHMENT OF NORMALLY SITUATED PLACENTA[1]

SYNONYMS: ACCIDENTAL HÆMORRHAGE; ABRUPTIO PLACENTÆ (DE LEE); ABLATIO PLACENTÆ (HOLMES)

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HÆMORRHAGE occurring before or during the birth of the child is always a dangerous and sometimes a fatal complication, and with the exception of injury to the birth canal, the hæmorrhage from a normally situated placenta is just as frequent as from placenta prævia. Holmes, Edgar, and others believe it is more common than placenta prævia.

Goodell, in 1869, collected 106 cases from the literature. To this Holmes added 200 in 1901, and the latter writer states that these figures do not give a true return of the cases, as a great number have very little hæmorrhage, either internal, external, or combined. They pass unnoticed. Colclough reported 82 cases in 1902, and since 1904, the writer has added 98 additional cases. There is considerable divergence of opinion among many authors as to its frequency, but an analysis of the cases tends to show that it occurs about once in 250 labors.

Etiology. Many theories have been offered as to the primary cause of separation of the placenta, and as yet none are entirely satisfactory. A normal placenta may rarely become detached under certain conditions, but in the great majority of cases, the placenta is

[1] Inaugural thesis presented to the Chicago Gynecological Society, November 19, 1909.

diseased or there is some pathological condition of the patient which affects the placenta, although it may appear normal on macroscopic examination. It is generally believed that renal disease is certainly a factor in causing separation of the placenta. This is sustained by the reports of six cases by Weiss, and two by Veit. Multiparity is a predisposing cause, as are endometritis and metritis. The exciting cause in many instances may be direct violence, such as a kick or blow upon the abdomen or over-exertion and stretching. Shock, fright, severe vomiting, coughing, and straining may be factors in causing separation of the placenta. The pulling of a short umbilical cord on the placenta or a diminution in size of the uterus after rupture of the membranes, especially in premature deliveries and hydramnios, or after the birth of the first child in twins may be causative. Blood diathesis was the etiological cause in one case (De Lee).

Pathology. When the placenta separates, the vessels of the decidua serotina are torn through and the uterus is unable to check the hæmorrhage owing to the products of conception still being retained and preventing the uterus from contracting and retracting down on the open vessels. Analogous to this is the retention of secundines in the early months of pregnancy. The blood thrown out may be entirely retained in the uterus part may escape, or it may all find its way exteriorly. This gives us the clinical classification as adopted by the German authors of external, mixed, and concealed hæmorrhage in contradistinction to the text-book classification of external and internal or concealed. When it is completely retained, we have a concealed hæmorrhage, and, according to Goodell, this may occur in four ways: First, an effusion of blood behind the placenta, the margins of placenta remaining adherent. Second, when the blood breaks through the membranes into the sac. Third, when the membranes are firmly adherent to the uterine wall and are not dissected away. Fourth, when the presenting part fits the lower uterine segment so snugly that the blood cannot find its way externally. This latter condition, the writer believes, would only occur when the patient is well along in labor and not where the cervix is undilated. The presenting part appears to recede into the uterus when the hæmorrhage comes on before dilatation. The original site where the hæmorrhage takes place is probably the most important factor in determining the variety of the resulting hæmorrhage, and the amount of separation of the membranes is the determining factor as to how much bleeding finds its way into the vagina. In the majority of cases, the blood finds its way out of the cervix. In 486 cases, 365 were external or mixed, and 123 were concealed.

The clinical picture of premature detachment of the placenta presents symptoms of a varying degree in the latter months of pregnancy and during labor. It varies according to the amount of hæmorrhage, and whether or not it is concealed, partially concealed within the uterus, or whether the bleeding is entirely external. In the former conditions, plus the hæmorrhage when it is severe, we have great shock and severe pain, while in the latter there is not much pain, if any, and we have the resulting anæmia in proportion to the amount of blood lost. In the concealed variety the hæmorrhage may be so slight as to escape detection until the labor is finished and the old clot found on the placenta. From this by degrees, we have increasing symptoms until such a severe hæmorrhage occurs as will prove rapidly fatal. In the concealed variety, the uterus is gradually distended until it becomes much larger than normal and is tense and hard and painful to the touch. The patients complain of severe pain over the abdomen. In this condition uterine contractions usually start shortly after hæmorrhage takes place. In the external variety, there is little or no pain, and uterine contractions are weak. In the mixed variety, the symptoms of both previously mentioned varieties are present, and are never consistent with the amount of blood lost externally.

It may be well to describe in detail one case of concealed hæmorrhage. The facial expression is one of great anxiety. The patient is very restless, usually rolling and tossing from side to side, moaning and complaining of pain; the skin is cold and covered with perspiration; there is a rapid pulse, sometimes hardly perceptible. On palpation, we find a very hard

and tender uterus over which we are unable to feel any part of the fœtus. The uterus is oval and greatly distended. On auscultation, no fœtal heart tones or uterine souffle are heard. On vaginal examination no blood is seen. The cervix is very little dilated or not at all. It is hard and resistant. When the os will admit a finger, the presenting part is felt with difficulty and covered tightly by the membranes. There are no contractions of the uterus. In the mixed variety, as just stated, we have symptoms of the internal variety plus external hæmorrhage. Although the uterus is distended there is considerable elasticity and over the lower portion of the uterus the fœtal parts can be felt and the heart tones and souffle be heard. The writer has never been able to outline an accessory tumor in these cases, such as is described by some authors. Great stress should be laid on the fact that the uterus is over-distended in both varieties described, and that the uterine muscle is more or less paralyzed. It, therefore, requires time for the muscle to recover and contract with sufficient force to expel the uterine contents and so insure against a very undesirable complication in these cases, that of post-partum hæmorrhage, against which all authors warn in treating these cases.

Diagnosis. The diagnosis, as a rule, is not difficult, as with the history of the case, the sudden onset, the acute anæmia, shock and other symptoms, this condition is differentiated from the other conditions to be mentioned very readily.

Extrauterine pregnancy with late rupture, or spontaneous rupture of the uterus, may simulate concealed hæmorrhage; but with the large, hard uterus those conditions can be excluded rather than diagnosed. In the external variety the absence or inability to feel the placenta will make the diagnosis positive. Rupture of the uterus, with external hæmorrhage coming on during labor, can be differentiated readily, in that the former comes usually after a prolonged second stage, while the latter may occur and usually does before the second stage is reached. Rupture of circular sinus is usually observed in second stage of labor.

Prognosis. All varieties of premature detachment of the placenta are dangerous and very serious complications of pregnancy and labor. The majority of the children die and many of the mothers.

The statistics give the mortality as follows:

	Mothers, per cent.	Children, per cent.
Goodell.....	50.9	94.4
Holmes.....	32.2	85.8
De Lee (Conc.h.)	50	90
Herzfeld.....	29	82.79
Colclough	9	90
Tweedy Rotunda	10	95

1. The maternal causes of death are, first, hæmorrhage. From the case reports of Goodell and others it appears that the maximum loss with recovery is two pounds. On the other hand, patients have died who have lost a much smaller amount, and others have recovered in whom the clots have weighed two pounds, or a fraction less, with some escape of liquid blood.

2. Non-fatal hæmorrhage plus shock is caused by the rapid distention of the uterus, from the dilatation of the cervix and from operative procedures following rapid dilatation of the cervix, such as version, perforation, and high forceps, and the shock is greater in this class of cases than in many others because the subjects are the poorest kinds to whom to give an anæsthetic and put them under complete anæsthesia. 3. Post-partum hæmorrhage has been severe enough in many cases to have caused death, and from the case reports, although the amount was not great, owing to the patient's collapsed condition, it was enough to settle the question of life or death. 4. Rupture of the uterus is not so rare in these cases and is practically certain to cause a fatal termination. Of the three forms of hæmorrhage, the concealed is acknowledged to be the most dangerous because of the severity of the symptoms. There is often a long delay in the treatment, while with the external and mixed variety there is seldom any delay in sending for medical assistance, as most patients have great fear of bleeding coming on suddenly during the latter months of pregnancy.

Treatment. Colclough gives the following clinical division of the cases that present themselves for treatment:

1. Cases where the hæmorrhage or shock,

or both, have been so severe that the patient cannot recover, no matter what treatment be adopted.

2. Cases where the symptoms are severe, but where a medical man's margin exists; proper treatment will result in recovery, but injudicious treatment will cause a different ending.

3. Cases so slight that under any treatment within certain limits the patient will recover.

The object of treatment should be (1) to secure a good uterine contraction or contractions. (2) To empty the uterus as soon as possible consistent with the safety of the mother.

What the proper treatment should be in the severe cases, where there is a medical man's margin, and the proper time to empty the uterus, are the two important questions to be answered, and since 1775, when Rigby published in his classic paper these two questions as to the treatment, have been much debated. Rigby, in 1789, describes how he waits for slight pains and some dilatation of the os before rupturing the membranes.

John Burns, in 1807, writes at considerable length on the value of the vaginal tampon. Engelby, in 1832, refers to the disputed lines of treatment as follows:

1. Rupture the membranes in preference to turning the child, and follow with delivery.

2. The employment of the tampon until the os uteri has undergone a certain degree of relaxation.

Churchill, in 1842, and Robert Lee, in 1844, discussed the treatment fully. In 1860, Braxton Hicks, and in 1898, G. Ernst Herman, advocated rupture of the membranes and rapid delivery for cases of concealed hæmorrhage. In 1894, Smyly reintroduced the method of tamponing or plugging the vagina, and up to the present time the treatment has not varied from these modes. The use of ergot is a debatable question. The majority of the authors of the present day advise emptying the uterus as soon as possible, and with this warn against the use of the vaginal tampon. Rupturing of the membranes early in severe cases of premature detachment of the placenta was done for the definite purpose of bringing on uterine contractions which are universally conceded to be a check and controller of the hæmorrhage. In the majority of cases, the uterine contractions failed to come and will be delayed longer in these cases than with a normal pregnancy, owing to the distention of the uterus and the paralyzed muscle. Braxton Hicks has fifteen maternal deaths in twenty-three cases under this treatment. The average time of delivery after rupturing the membranes in six cases was fourteen hours. Goodell is very emphatic as to the necessity of early rupture of the membranes. He reports fifty-two cases which recovered; eight of these cases were not severe enough to require treatment. This leaves forty-four severe cases which recovered. Out of this number the membranes were ruptured, but under the following conditions or circumstances:

1. Many hours after the onset of hæmorrhage.

2. When the patient is having strong pains and is in labor.

3. When the os was more or less dilated.

The excellent results of rupturing the membranes in the above thirty-one cases was due to the delay in rupturing them after the uterus had opportunity to recover itself following the hæmorrhage. It was very difficult to analyze many of his cases. Of the fifty cases which died, in fifteen, the membranes were ruptured before any contractions or dilatation of the cervix had set in. The rapid dilatation of the cervix in the many ways we have at our disposal, and the emptying of the uterus by version and extraction, craniotomy or forceps, immediately after the diagnosis is made, is a standard line of treatment, and has given good results, and would no doubt give even better results and reduce the mortality very much were this treatment delayed for a variable time, according to the judgment of the operator, after the initial hæmorrhage has taken place. This delay is practiced especially in the concealed and mixed varieties.

The objections to immediate interference are: (1) These patients are in a state of collapse and further shock is very undesirable. (2) The dilatation of the cervix and the emptying of a pregnant bleeding uterus, after the formation of the placenta, in many cases increases the bleeding in a marked degree,

and this state of affairs obtains in many cases of premature detachment of the placenta. (3) These patients are very poor subjects for anæsthesia, and in some instances the operator has additional difficulties to face in not being able to administer an anæsthetic at all. Scopolamin may have a future as an anæsthetic in these cases. (4) There is great danger of post-partum hæmorrhage after the operation. (5) Lacerations of the cervix.

The indications for delaying treatment are: (1) It gives the patient a chance to rally. (2) The uterus recovers itself and begins to contract rhythmically and with force. (3) Part of the volume of blood lost can be replaced by salt solution and so guard against future loss from our operative procedure. (4) There is much less danger of post-partum hæmorrhage. (5) We can check the original hæmorrhage by the use of a properly applied vaginal tampon and abdominal binder.

The vaginal tampon and binder, as advocated by Colclough, Smyly and Tweedy, and as used at the Rotunda Hospital, have their place in the treatment of this form of hæmorrhage for the purpose of accomplishing the delay just spoken of, and their limits should be the time when the uterine contractions are of good quality and are regular. As we have no standard to guide us in determining the strength of uterine contractions, the removal of the tampon must be left to the judgment of the operator, the condition of the patient, and what dilatation of the cervix the contractions have produced. The above authors leave the tampon in place until the uterine contractions expel it, if within twenty-four hours. Should it remain twenty-four hours, the tampon is removed and replaced. The objections to this line of treatment are: (1) In many cases we unnecessarily prolong the labor. (2) The danger of infection. (3) The danger of rupture of the uterus. (4) Cystitis and vesico-vaginal fistula. (5) The positive loss of the child, which might be saved, or could be saved by a more rapid delivery. (6) Possibility of placenta prævia.

That the plug and binder do control and check the hæmorrhage is a clinical fact, but as to the exact way in which it is done has never been satisfactorily explained. In the description of this method it will be shown that the tampon in the vagina forms a solid mass. The uterus is forced down on this mass by a wide abdominal bandage exerting pressure on part of the fundus and the anterior wall. This pressure outside is transmitted to the fluid inside and, at the same time, the walls of the uterus are prevented from distending. As soon as the intrauterine pressure equals the blood pressure, the further escape of blood is impossible. This is a purely mechanical proposition, and is the only reasonable explanation so far given. The treatment will be successful where the membranes are not ruptured, and even, as shown by case reports, where the liquor amnii has escaped.

Plugging the vagina. Tweedy in 1898 described the process of tamponing the vagina in premature detachment of the placenta. The method in use now differs a little from his description, and the technique perfected somewhat over his. The tampons used are of sterilized cotton wool, about the size of a walnut, and moistened with salt solution, or with a weak bichloride solution. After our usual obstetrical preparations, the patient is placed in the lithotomy position and the fingers of one hand are used as a speculum in preference to a metal instrument, as the fingers separating the vulva can steady and direct the first pledgets introduced. These pledgets are taken out of the solution separately and squeezed almost dry. The first one is placed in the posterior fornix, and the fornices are systematically packed with a moderate amount of pressure. The object is to form a ring around the cervix, and the packing is continued downward until no more can be introduced into the vagina. A large piece of gauze is placed externally, and an assistant holds the tampon in place while the abdominal and perineal bandages are applied. An anæsthetic need not be given. It is only necessary with a very restless patient, and it usually requires very little anæsthesia to keep the patient quiet.

Application of binder and perineal bandage. The binder and perineal bandage should have been placed under the patient before starting operation. Strong pins and a stout unyielding binder are used. The first pin is placed well

above the fundus and the binder secured very tightly downwards as far as the symphysis. The perineal bandage is now pinned well up in front on the binder. In this manner pressure is made on the front of the uterus and abdomen by the tight binder and the uterus is forced downwards as well on the firm vaginal tampon.

Smyly and other writers state that in addition to controlling hæmorrhage, the tampon and binder excite labor pains, induce rapid dilatation of the os, and act as a tourniquet for the uterine arteries. These last three statements may be doubted. The uterus very soon after the tampon and binder have been applied becomes much softer to the touch, and the patient revives in a remarkably short time. In most cases pains begin to occur regularly and with force, and, as stated previously, it is a matter of judgment when the tampon should be removed. There should be, if possible, at least three hours from the time the tampon was inserted until delivery, to insure against post-partum hæmorrhage, and give an opportunity for the patient to rally. The tampon must be removed, first, when the pains become vigorous; second, when the tampon begins to bulge; third, when hæmorrhage appears externally, which shows that the tamponing has not been efficiently done; fourth, any attack of dizziness or faintness. Should nothing happen within eight hours, the tampon is removed, the patient catheterized, and a second tampon inserted. In some cases, conditions are so satisfactory as not to require the application of another tampon. The hæmorrhage when once checked does not start again.

The writer has collected the following cases where hæmorrhage was controlled and pains came on strong.

4 hours or less	15
4 to 7 hours	17
7 to 12 hours	24
12 to 24 hours	10
Over 24 hours	3
	69

Seven deaths; two rupture of the uterus, one died on the fourth day, one died of sepsis on the twelfth day. Out of sixty-nine cases it may be said that the hæmorrhage was controlled in sixty-six cases.

The following cases were selected from the writer's experience to illustrate the different varieties of hæmorrhage and treatment adopted:

CASE 1. Mary O., aged 37. Pregnancy, 14; six children living, two dead, five miscarriages. Examination showed the uterus near full term, child living, and left occipito-anterior position; uterus soft and not contracting. The bleeding started at seven A. M. and increased as the patient moved about. At 8:30 A. M. the hæmorrhage was quite profuse. Patient in good condition. Pulse 120. Os admitted one finger. Tampon and binder applied. Pains came on shortly, and the tampon was removed in two hours and fifty minutes. The cervix was half dilated; membranes ruptured. The head descended into the cervix; dilatation completed, delivery with forceps effected, and child lived. Patient made an uneventful recovery. Placenta showed no marked changes.

CASE 2. Mary L., aged 30; fourth pregnancy. No miscarriages. Pregnant between seventh and eighth month. Examination showed the uterus the size of full term, hard at the fundus, extending down to the level of the umbilicus. There was difficulty in diagnosing the position of the child owing to the tenderness over the abdomen. No heart tones were audible. Vaginal examination showed external bleeding, os not dilated. The patient was in a poor condition; she was anæmic and shocked. Pulse 130 to 140 and of poor quality. Diagnosis, mixed hæmorrhage. Patient started to bleed at 2:30 A. M. Plug and binder were applied by 4:30 A. M. Strong pains at 11:30. Tampon removed. Os admitted four fingers. Breech presentation; membranes ruptured; foot brought down, and dead baby delivered. Clots followed, which weighed twenty ounces. There was no post-partum hæmorrhage. Patient in much better condition. Placenta showed slight changes.

CASE 3. Hannah L. First pregnancy. The history gives a pregnancy of seven and a half months. The patient became ill very suddenly with pain in the abdomen, with nausea and faintness, about 9:30 A. M. I saw her at 10:30. She looked bad and was suffering much. She was unable to talk coherently. Examination showed the uterus larger than full time, hard, rigid, very tender; impossible to outline the child, or to hear any heart tones. The pulse was 150 to 160. Vaginal examination showed there was no sign of bleeding. Os admitted one finger easily, presenting part not palpable. A diagnosis of concealed hæmorrhage was made. The plug and binder were applied at 10:30 A. M.; the pulse dropped very soon to 120; the uterus relaxed remarkably; the patient given resuscitating treatment with good results. Pain started at 4:00 P. M. and at 8:00 P. M the tampon began to bulge. It was removed, and the os was almost fully dilated. Membranes ruptured, and the child was delivered with forceps. Placenta followed in five minutes. The clots weighed two pounds, with some liquid blood. There was no post-partum hæmorrhage. Patient made a good recovery. Child dead. Placenta showed large infarcts. There was no specific history

of renal disease. She was a hardworking woman. She had slight cramps in the abdomen the day previous to becoming ill.

CASE 4. Maria M., pregnancy, eleventh; aged 38; six and a half months' pregnant. Patient had been drinking and fighting shortly before being taken ill. Examination showed a uterus four fingers' breadth below ensiform cartilage, fairly hard and resistant; no fœtal parts made out; no heart tones. Vaginal examination showed considerable bleeding; os undilated. Diagnosis, mixed hæmorrhage. Patient was very intractable and hard to handle. At 8:00 A. M. tampon and binder applied, followed by usual treatment. Her general condition was not bad before operation, and she was comfortable all day. She had some pains, but they were not strong. Owing to many difficulties, the only thing done for the patient was to pass a catheter eight hours after tamponing. At 8:00 P. M. the patient suddenly became very ill, quickly went into collapse. The tampon was removed. The os was fully dilated; the membranes were ruptured, and a dead baby delivered, which presented by the breech. A large tear was found in the left fornix, running into the broad ligament. This was packed, and every effort made to sustain the patient. She died about one and a half hours after rupture. Placenta showed slight changes.

CASE 5. Mary C., aged 40, pregnancy 15. No miscarriages. Examination showed normal sized uterus, very prominent in abdomen. Child in left occipito-anterior position. Patient was then nineteen hours in labor. Vaginal examination showed os almost fully dilated; membranes unruptured, and head not fixed. Pelvis large and roomy. Membranes were punctured with stylet and head descended. Pains were not strong, and one-half hour from the time of rupturing membranes the patient suddenly became very ill; pulse became rapid, and she moved violently about the bed. The uterus was very hard. She was delivered very quickly with forceps; child alive, and followed by several good-sized blood clots and meconium with liquid blood. There was no post-partum hæmorrhage. She recovered nicely. The placenta showed no particular changes. Diagnosis, concealed hæmorrhage.

CONCLUSIONS

1. Rupture of the membranes and leaving delivery to nature are only justifiable when the uterus is contracting vigorously and the os is fully dilated.

2. Rupture of the membranes and rapid delivery should not be done until the uterus is contracting rythmically, the patient rallied, and the os undergone some degree of dilatation.

3. The tampon and binder should be used when there are no contractions of the uterus, no dilatation, and where the patients are in a collapsed state, and its use continued until such time as the patient and uterus have recovered.

4. An external hæmorrhage is converted into a concealed hæmorrhage by the use of the tampon, if the uterine walls are incapable directly or indirectly, of withstanding a pressure within them equal to the maternal blood pressure, and should they be distended as the result of increased intrauterine pressure, the tampon and binder will, if applied properly, render them capable of holding the pressure of the blood and so control the hæmorrhage.

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ACTINOMYCOSIS OF THE UTERINE APPENDAGES[1]

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ACTINOMYCOSIS of the uterine appendages has been observed so rarely that we find no case reported in the medical literature of the United States and only twenty-four such cases in that of Europe. This is not due entirely to the absolute scarcity of this pathological condition, but it may be attributed to the teaching of Bollinger, who demanded that corpora flava must be present for the justification of a diagnosis of actinomycosis. Karewski pointed out the necessity of a close bacteriological examination of the suspicious material. I believe from the experience of my own case that a number of instances have occurred in the practice of many surgeons who deal with large material in which the micro-organism in question was the cause of the disease, but had not been recognized on account of the omission of careful and repeated bacteriological examinations of the specimens by experienced pathologists, such as I had in Dr. Davis, who worked out the pathological side of my case. This holds true possibly for many abscesses and obstinate fistulas, which have not resulted, after removal of the appendages, in a perfect cure.

Actinomycosis has been demonstrated to be a rather frequent affection of the human race, as compared with former opinions, inasmuch as the literature now contains about 650 cases, according to Ruhrah, of which 135 proved to be abdominal manifestations. The subject of actinomycosis, generally speaking, is still one of the most difficult problems from a bacteriological and biological standpoint. This is more readily understood when we peruse an article by Dr. Heijiro Nakeyama, of Tokio, Japan, entitled "Impfversuche auf Acti-nomycosis Asteroides Eppinger an Meershweinchen," Hygienic Institute of Prague.

Many cases may give the impression of tuberculosis macroscopically, and even microscopically they may look so similar to tuberculosis that some of the cases have been denominated pseudo-tuberculosis. Actinomycosis of the human race possesses the property of shaping itself into neat garlands, which form a picture like streptococcus chains, so that Petruscky uses the term "strepto-trichæ" for such microscopical pictures. Shabad makes the following differentiation: 1. Actinomycosis typica produces pus with corpora flava and is non-acid fast. 2. Actinomycosis atypica, pus without corpora flava, acid fast. (*a*) Actinomycosis atypica simplex liquefies gelatin and produces in animals a pseudo-tuberculosis. (*b*) Actinomycosis atypica pseudo-tuberculosis does not liquefy gelatin, and produces pseudo-tuberculosis. Injections of pure cultures in the lower animals met with no success. Wright states after he had made many inoculation experiments with actinomycosis from fifteen different origins, especially intraperitoneally, that the micro-organism of actinomycosis shows little or no infectious activity in such experiments. It would seem, therefore, that other factors, besides the micro-organism, must play a prominent part in the production of a progressive actinomycosis.

Hamm informs us in a recent article in the Beiträge zur Geburtshilfe that he succeeded in producing the disease in animals after injections with pus of actinomycosis. He made an observation of the noteworthy fact that the virulence increases gradually in proportion to the continuation of the inoculation in the same animal species. A very important and instructive experiment in regard to the differential diagnosis is at hand from the hygienic laboratory of Hueppe, which deserves to be mentioned in this connection. Actinomycosis cultures, when injected into tubercular animals, easily kill; while tubercular injections in animals affected with actinomycosis seem to have almost no effect. Interesting is the fact that actinomycosis hyperæsthesia is a temporary condition which gradually makes way for the normal condition after about a month, while a tubercular hyperæsthesia never

[1] Read before the Chicago Gynecological Society, November 19, 1909.

ceases. His explanation is that actinomycosis appears to be more localized and shows a tendency to total restitution ad integrum. As long as this process is not disturbed by secondary adhesions, an unlimited invasion of the organs does not take place. Tuberculosis, however, increases steadily and proceeds from one organ to the other until the whole organism is invaded.

In my second consideration of this subject, I shall deal with the mode of infection of the appendages of the uterus. A study of the different cases found in the literature demonstrates that in none of the cases has positive proof been furnished of primary infection of the uterine appendages, and such origin seems impossible in view of the characteristics of the micro-organism and the anatomical disposition of the organs in question. This statement has reference even to the famous case of Giordiano in 1898. He points out in his case two responsible factors for facilitation and proof of primary invasion, namely, first, prolapse of the uterus, which existed secondly in a poultry fancier, who as such was exposed to the danger from contaminated straw.

H. E. S. Thompson, in the British Medical Journal, speaks of vaginal infection, and desires to be placed on record in that respect, in a case in which the patient had, after repeated attacks of peritonitis, both appendages of the uterus, as well as the appendix vermiformis removed, followed by multiple abscesses of the trunk and the abdomen. His patient died after eight months from gangrene of the right leg. A diagnosis of actinomycosis had not been made up to that time; but autopsy showed actinomycosis, which could then be demonstrated in the preserved adnexa.

My doubts and objection to this interpretation of the mode of infection are: 1. Actinomycosis has not the power and quality of motility the same as the spermatozoon. 2. Actinomycosis does not move by the lymph route as far as is known. 3. It is doubtful whether the blood current is utilized in its transmission. 4. On the other hand, Partsh's and Israel's research work demonstrates that actinomycosis spreads by infiltration, penetration, continuity, and contiguity. 5. It seems quite improbable that the microbe should travel such a long distance as that from the vulva through the vagina, uterine canal, to the ovary and tube, without finding a favorable spot for nestling.

Zeman's case in 1883, which, at the same time, represents the first case of actinomycosis of the uterine appendages on record, was claimed to be one of primary infection for a long time, but the arguments in favor of this condition could not stand the pressure of pathological reasoning. Thompson applied the term "ascending" infection to his case, while just the contrary "descending" forces itself upon us, when we bear in mind, first, that we very frequently introduce small particles of soil adherent to salad, fruit, and other vegetables into the gastro-intestinal tract in a raw state. 2. These particles of soil may be contaminated by actinomycosis. 3. The intestines may be at the time for one reason or another favorably predisposed to the habitation and cultivation of the micro-organic element. 4. That in all cases the intestines were firmly adherent to the pelvic organs.

The mode of infection of the intestine and the spreading of the disease to the peritoneal organs are as follows: Primary actinomycosis of the intestinal tract manifests itself in a superficial invasion of the mucous membrane in the formation of whitish patches, or in the more diffuse variety by the formation of nodules beneath the surface of the mucous membrane. These nodules undergo degeneration, ulcerate, and rapidly extend beyond the original site, invading the greater part of the peritoneum and various organs, especially the liver. As the result of the peritoneal invasion numerous adhesions form, which will prevent a general peritonitis, and, at the same time, may seriously embarrass the surgeon in his attempt to eradicate the disease. (Keen.)

The third consideration pertains to the treatment, which must be two-fold, surgical and medicinal. The surgical treatment follows the rules of other extirpations of infected organs of the pelvis, with the addition of extensive use of the sharp spoon, and the local application of powerful antiseptics, two of which seem to be of special value. One has been suggested by Dr. Arthur Dean Bevan in a paper published in 1904, in which he reported six interesting cases, namely, sulphate of copper solu-

tions in one per cent solution, which has given very satisfactory results in my case; and the other agent, tribromphenol-bismuth, which has been advocated by Hueppe. From the publication of Wolfler's clinic, we learn that out of thirty-nine cases which came under treatment during the last fourteen years fifty per cent resulted in a cure under the combined treatment. He states that there is no difference between the iodide of potash and the iodide of soda, as some claim. His conclusion is that actinomycosis when circumscribed, should be extirpated like every other tumor and if this is not possible, as in the diffuse forms, partial extirpation should be practiced and the iodide of potash administered internally. Tuberculin therapy is still problematical.

Report of case. The patient was a young lady nineteen years of age with a negative family history. She was taken sick about seven years ago with a severe attack of pain in the stomach, followed by vomiting, chills, and fever. Every two or three months she suffered in that way. Three years ago she could not walk erect on account of continuous pains. She did not menstruate for three months, and remained sick all winter. In the spring of that year she went to Denmark. She remained fairly well for a year, but was not entirely free from pain and was always constipated. The diagnoses that were made by different physicians whom she consulted varied between malarial fever, anæmia, indigestion, biliousness, and appendicitis. Of late the pains were located more in the lower part of the abdomen, and were more severe in character, so that the attacks assumed the nature of convulsions. Difficulty of defecation advanced to the state of partial obstruction. After her last attack, different surgeons were called in consultation, and an operation was agreed upon but not performed. The diagnosis was appendicitis. A week after this she came under my observation.

Status præsens. Development of fat and muscles only fair, color of face rather pale, circular and respiratory findings negative, abdomen tympanitic; bimanual examination revealed a large mass in the pelvis. Uterus and ovaries could not be outlined. The masses were sensitive to the touch. Urine-feces negative — leucocytosis 12,000. Diagnosis, double pyosalpinx.

On opening the abdomen through a median incision, a large gelatinous mass was first observed, and beneath this a solid, very resistant, mass occupying the larger and lesser pelvis, could be felt. This condition seemed so unusual to me that I asked Dr. Davis, our pathologist, to step in and give his opinion; but we did not agree as to any definite diagnosis. It looked like a degenerated sarcoma springing from the pelvic bone, but did not seem plausible on account of the long duration of the condition. The increasing bowel obstruction necessitated interference and it seemed advisable to obtain some of the tissue from the growth for microscopic examination. While trying to outline the fundus of the uterus I met very deep down a fluctuating area, into which I penetrated with my finger with the result that an extraordinary copious flow of very fetid pus escaped. This permitted me to return to my first diagnosis of pyosalpinx, and I extirpated both appendages. The gelatinous masses were undoubtedly nothing but distended lymphatics, and the density of the mass finds its explanation in the characteristic pathology of actinomycosis, which tends to fibrosis. The report of the examination of the pus during the operation was negative. A few days later, Dr. Davis found actinomycosis and cultivated the fungus. The convalescence of the patient was accompanied by a rise of temperature. The discharge from the drainage opening was very profuse, we irrigated with copper sulphate solution 1-100. Internally large doses of iodide of potash were administered. The wound closed up after 3 weeks and the patient left the hospital in a very good condition four weeks later. A month afterward she presented herself for re-examination. I found her free from pain, with a good scar in the line of incision, and she had gained quite a few pounds in weight.

PATHOLOGICAL EXAMINATION — DR. DAVIS

Large abscesses, the size of a small orange, occurred in both ovaries. They contained thick, greenish-yellow, tenacious, fetid pus, and the wall, about one centimeter in thickness, consisted on the outer surface of dense connective tissue, within which was a layer of granulation tissue of a reddish color interspersed here and there with regions of yellowish necrosis. About the appendages in the pelvis were large gelatinous masses several centimeters in diameter. The tube, including the finibria on the left side, was firmly bound to the ovarian abscess by old fibrous tissue. The mucosa was not involved and the tube was not enlarged. On the right side the tube and fimbria were likewise firmly united to the abscess by adhesions; but the fimbria and the greater portion of the tube were enlarged and the lumen was distended and contained thick pus. A small portion of the tube near the uterus, by microscopic examination, showed little or no involvement.

Histologically the wall of the abscess may be divided into three zones. The outer zone is composed of dense-connective tissue containing a moderate number of blood-vessels, many of which are surrounded by masses of round cells. Within this zone is a second zone made up of younger connective tissue, as a rule rich in blood-vessels. In many places in this zone the tissue is composed almost entirely of plasma cells. Polynuclear leucocytes are also common, and epithelioid cells in places are abundant. Here also occur giant cells which are large multinuclear cells containing from five to fifteen nuclei always arranged in the center and having abundant finely granular protoplasm. The inner zone is made up almost entirely of pus cells. Here and there are some large cells containing brown

pigment granules, and occasionally cholesterin crystals are seen.

Sections of the tube reveal, in a general way, a structure from without inward similar to that of the ovarian abscess. Many leucocytes are present in the lumen. The mucosa is infiltrated with leucocytes and round cells, and just outside the mucosa plasma cells are often abundant. The wall is thickened and nearly everywhere may be found more or less round cell infiltration. Giant cells of the type above described are here also occasionally encountered in the submucosa.

In smears of the pus Gran's positive, non-acid, fast branching filaments were easily found. No yellow granules were seen microscopically. In the outer part of the tube typical rays were found in sections of the tissue. The branching filaments were easily found also in sections of the ovarian abscesses stained by Gram's stain.

Actinomyces were obtained in pure culture from the pus. Anaerobic and aerobic cultures and also stained smears revealed no other organisms.

The organism is non-acid fast, grows better anaerobically, shows distinct branching, grows slowly, and produces the typical growth of actinomyces on agarn-broth, etc. Inoculation into guinea pigs with pus from the abscess, and with the organism in pure culture, gave negative results.

The stools were examined for pus, blood, and actinomyces with negative results. The urine contained no organisms.

The patient gave a distinct tuberculin reaction (V. Pirquit). She did not react to a concentrated extract of actinomyces prepared by digesting the organisms for several hours with n-10 Na OH.

Following the operation some discharge from the drainage tube continued, in which were found typical branching actinomycotic filaments.

CONCLUSIONS

1. Actinomycosis of the uterine appendages is most likely always a secondary infection.

2. The infection takes place from the gastro-intestinal tract, and may be most frequent from the appendix.

3. The mode of secondary infection is by infiltration, penetration, continuity, and contiguity.

4. Actinomycosis of the ovary and tube in long lasting cases is surrounded by dense, connective tissue formation, which may lead to erroneous diagnoses or different kinds of tumors of hard consistency.

5. The gross macroscopic and microscopic picture resembles that of tuberculosis in many cases.

6. Bollinger's desideratum for the diagnosis of actinomycosis, namely, that corpora flava must be present, is untenable at the present time.

7. Repeated bacteriological examinations, and sometimes long and tedious ones of the same specimens, must be made, to insure a correct interpretation of suspicious pathological material.

8. Inoculation with pure cultures into the animal is not attended with success.

9. Only the injection of pus with actinomycosis, or the ingestion of material upon which actinomycosis is grown, will prove successful in the production of actinomycosis in the animal.

10. Actinomycosis does not travel by the lymphatics, and probably not by the blood route.

11. The prognosis is favorable in circumscribed cases, which is most likely the condition in which we find the uterine appendages.

12. The treatment consists in radical extirpation and free drainage; the application of triboromphenol-bismuth, or irrigation of the fistula with copper sulphate.

13. The internal administration of large doses of iodide of potash up to 75 grains a day, which exerts a positive healing effect.

14. A careful study of apparently innocent pus from pelvic disease as well as secretions from obstinate fistulas after laparotomies for oravian and tubal-pus infections may result in finding actinomycosis more commonly to be the cause of the pathological changes than has been the case heretofore, and in consequence, different treatment inaugurated which will insure, perhaps, a higher percentage of final cures.

SUBCUTANEOUS PERFORATION OF THE INTESTINE

With Consideration of a Mechanism not Hitherto Described

By FRANK A. PALMER, M. D., Morris, Illinois

A PROPER understanding of the mechanism by which perforation of the intestine without external injury of the abdominal walls is produced was not achieved until a comparatively recent date. It was believed by the earlier surgeons that such a rupture of the bowel occurred as a result of a general increase of intra-abdominal pressure, which caused the bowel to burst from the compression of the contained gases. This rather indefinite explanation passed current for a great many years. In 1875, however, Longuet demonstrated by a series of animal experiments that at least the principal factor in the production of such injuries is the crushing of the intestine against the bony walls of the abdomen by the object causing the injury. He threw grave doubts upon the validity of the older bursting mechanism. There remained, however, in the literature three classical cases of perforation of the intestine without direct injury to the abdominal wall which could not be otherwise explained. (Cases of Kaczorowsky, Moritz, and Mikulicz, cited by Bunge, Beitræge zur Klinischen Chirurgie, vol. xlvii, p. 790.)

Moty then came forward with mention of another mechanism by which the bowel was torn between the offending object acting with a sliding motion, and the fixed point offered by the mesentery of the affected loop. He then classified the subcutaneous injuries as occurring as the result of:

1. Écrasement, a crushing of the bowel.
3. Déchirure, a tearing by traction.
2. Éclatement, a bursting from increased pressure within the bowel.

This classification has been pretty generally followed by succeeding writers (Neuman, Petry, Sauerbruch).

Sauerbruch then showed that a bursting rupture of the intestine occurred only if both ends of a loop were occluded at the same time that compression of the contained gases occurred, and maintained that bursting of the intestine through increase of intra-abdominal pressure alone was impossible. He left the cases of perforation of the bowel without direct injury to the abdomen without explanation. Bunge then reported three cases in which he demonstrated that the bowel rupture occurred as the result of intra-abdominal pressure pushing a knuckle of intestine out of an open hernial ring in such a manner that the bowel was burst by the pressure of the fluids and gases contained in it. (See also Borszéky, Beitræge zur Klinschen Chirurgie, bd. lxi, p. 784.) In two of Bunge's cases the injury occurred through simple increase of intra-abdominal pressure, without direct injury to the abdomen. He also demonstrated that one at least of the classical cases, which had hitherto defied explanation, that of Mikulicz, belonged to his group.

Thus we may say that up to the present time only two forms of the bursting rupture have been definitely accepted, — the mechanism of Sauerbruch in which both ends of the loop are occluded at the time that the pressure is applied to it, and the method of Bunge in which the loop of bowel is partially extruded from a hernial opening at the moment that the rupture takes place. The reported cases of these two varieties have all been rupture of the small bowel.

I wish to report the histories of two cases of perforation of the large intestine, which I believe to belong to the bursting ruptures, and which constituting a typical injury, are to be explained by a mechanism which does not fall under either of the above varieties.

Case 1. B. E., about 45 years of age, a teamster for a brewing company, was carrying a keg of beer across a plank laid from the wagon to the sidewalk. The end of the plank slipped from the wagon, and the man fell upon his back with the beer keg upon his abdomen. Laparotomy four hours later showed injury to the mesentery of the small bowel, due to crushing between the keg and the spinal column, from which severe hæmorrhage had taken place. There was also present a hole about an inch long on the anterior aspect of

the head of the cæcum, with a large amount of extravasation of intestinal contents into the pelvis. The patient died a few hours after the operation from the effects of the hæmorrhage.

CASE 2. W. Y., age 38, a lineman, was struck at 4 P. M. by a large piece of a tree stump which was thrown from a blast three or four hundred feet away. The fragment was traveling along the ground, and so struck the unfortunate man as to fracture his right thigh near the knee, and produce an extensive contusion of the abdomen. The blow was a glancing one, carrying away the right half of his coat and vest. He was admitted to the hospital at about seven o'clock with a good pulse (eighty per minute), and very little pain. The rigidity of the recti was present, but slight in amount, and in view of the evident external tenderness of the abdominal wall, and the excellent pulse, was not given the weight that it perhaps deserved. His blood pressure at 9 P. M. was 238 mm. By one o'clock at night the blood pressure had fallen to 98 mm., and the pulse was increasing in frequency. On these indications the abdomen was opened at 4 A. M., twelve hours after the injury. A very considerable amount of blood was present in the abdominal cavity, but no active hæmorrhage. The right half of the abdomen and the pelvic cavity were extensively soiled with fæcal material, the pelvis especially containing a large amount. The peritoneal surface in these regions was red and injected. The only perforation of the bowel present was a longitudinal rent, one and one-half inches in length on the inner anterior aspect of the cæcum, a little above a line drawn from the ileo-cæcal valve to the base of the appendix. The edges of the mucosa were pouting through the wound. The injury was repaired and the peritoneum was carefully cleaned with wet sponges. The abdominal wound was closed with a large packing down to the head of the cæcum. Died on the fifth day of general peritonitis.

These perforations evidently occurred as the result of the ascending colon being compressed first above, driving the contained fluids and gases into the head of the cæcum, and then below, producing such tension in the cæcum as to burst its wall.

In these cases the injury was so located as to make it difficult to conceive that they were produced by crushing, the head of the cæcum lying normally in the pelvic cavity. That the injury was not produced by crushing against the brim of the pelvis is evinced by the fact that in the second case the rent ran parallel to the axis of the ascending colon. Further in both cases the extravasation of fæcal material was far in excess of the amounts one would expect from leakage in the times given.

It is also to be observed that in distinction to the cases hitherto reported, the injury was to the large bowel, in a portion where its fixation to the abdominal wall makes the occlusion of both ends difficult to imagine. Also the nature of the injury was such as to make it readily conceivable that the pressure may have been exerted first to the upper portion of the colon, and a moment later to its lower portion.

In view of the fact, that the area of the opening through the ileo-cæcal valve is so small in proportion to the area of a cross section of the cæcum, a rupture of the cæcum from the tension of its contained fluids and gases should be expected under such circumstances, whether the ileo-cæcal value was patent at the instant or not. But it is quite conceivable that the valve might be occluded at the given instant, by the distortion produced by the traction of the mesentery of the ileum acting against the tendency of the cæcum to carry the ileum with it in its downward movement, resulting from the downward rush of the cæcal contents.

At any rate we have here, evidently, a typical form of perforation of the intestine resulting from a definite form of injury, and seemingly presenting a definite location of lesion.

Two other points are of interest in connection with the cases. First the extensive soiling of the peritoneum with fæcal material due to the explosive character of the perforation, giving it an especially grave prognosis, and secondly, the value of the fall of blood pressure as an indication of internal hæmorrhage, as illustrated in the second case.

PELVIC TRANSPLANTATION METASTASIS AS A MEANS OF RECOGNITION OF HOPELESS ABDOMINAL CARCINOMA

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IN the treatment of all carcinomata it is quite as necessary to have definite rules for guidance against operation as for operation. It is important to lay stress upon every warning point, as the present necessity for exploration only emphasizes our more or less limited knowledge, and it is our duty to save as many patients as possible from the shock of even so slight an operation as a simple exploration, when by a more thorough examination some of them might at once be definitely classified as hopeless.

It is to routine digital examination of the rectum with the patient in the knee-elbow position, and bimanually with the patient in the lithotomy position, to which we wish to call particular attention in this paper; and no case of abdominal tumor should be operated upon without its being done. By this means alone we have been able to prove over six and one-half per cent of upper abdominal carcinoma to be hopeless.

While reviewing the histories of some four hundred and thirty-five cases of upper abdominal carcinoma seen in the last twenty months at the Mayo clinic, Rochester, Minnesota, we were surprised to find so large a percentage of them showing the following positive contraindication to operation. For example, upon examination a small, hard, nodular tumor is found with the clinical history and laboratory findings of carcinoma of the stomach. It is freely movable and apparently mechanically removable. On rectal examination at a point about three to five inches from the anus along the anterior rectal wall (on what has been termed by Dr. George Blumer the "rectal shelf"), above the prostate in the male, and above and behind the uterus in the female, we may find a hard nodular mass distinctly originating within the peritoneal cavity. These may be single or multiple and may vary in size from a small bean to an orange. Sigmoidoscopic examination shows the rectal mucosa uninvolved. This may remain as a distinct neoplasm or may, through a process of infiltration, begin the formation of a cresent-shaped area of cartilaginous hardness that partially surrounds the bowel. We have not seen a case that produced any stricture-like symptoms, nor have we seen one that gave symptoms suggestive of rectal carcinoma. The presence of free fluid in the abdomen often indicates a hopeless condition because it is indicative of a considerable peritoneal irritation and usually actual involvement, but implantation carcinomata are often found before free fluid can be distinguished clinically and before secondary masses can be distinguished through the abdominal wall. It must be borne in mind, however, that negative findings are of no value. One must also be guarded against mistaking for this condition, fæcal concretions higher up in the sigmoid, and old inflammatory deposits in the pelvis. Tuberculous peritonitis can be differentiated by the "feel" of the mass, its location being more diffuse, taken together with the history of the patient. Dr. Blumer cites a case where a small subperitoneal myoma projecting into Douglas' pouch caused some confusion. He also calls attention to the fact that Houston's fold of the rectum is sometimes thickened.

Once the peritoneal covering of the primary growth has been broken through, the carcinoma cells are spread in more or less numbers throughout the serous cavity by gravitation, intestinal movements, or the normal circulation of the intraperitoneal fluid. We believe that a fair percentage of these cells will early find their way to the lower part of the cavity, and because of the position of the rectum acting as a shelf, they will in many instances lodge thereon. The tendency to gravitate to the pelvis is more pronounced because most of the patients with upper abdominal carcinoma are able to be about and often do light work.[1]

[1] This is contrary to those experiments where shot have been introduced within the peritoneal cavity and are found not to gravitate to the pelvis; nevertheless, the clinical evidence seems to warrant this assumption.

The above findings, which are brought out better by the rectal examination than by the vaginal, have been of value also in leading to a positive diagnosis of carcinoma of the stomach in cases where no tumor could be palpated even on distention. They are also, if present, positive proof in the differential diagnosis of carcinoma from that little understood class of cases with a stomach history and laboratory findings typical of carcinoma of the stomach, but in which no cancer is present. Findings of this character will also establish the diagnosis between a well starved ulcer case with considerable tumefaction and a carcinoma case. A few cases have been referred to us as being pelvic. Examination showed findings as described above and directed our attention to a stomach history the patient had not emphasized, and here we found the primary and important condition.

Several years ago in this clinic, when attention first began to be paid to these pelvic deposits, a few cases were operated upon, the local condition being such as to indicate a radical procedure, but on slipping the hand into the pelvis the peritoneal deposits were found to be definitely carcinomatous. Through correspondence we found, further, that quite a number of patients similarly affected where operation was refused solely because of the deposits, had died in a few months. As a means to more exact prognosis such deposits demonstrate the life of the patient to be positively limited and to have passed beyond the operative stage.

In the four hundred and thirty-five case histories, were three hundred and seven cases of carcinoma of the stomach, the remainder being of the intestine, pancreas, liver, and gall-bladder. In this number twenty-eight showed secondary deposits on the rectal shelf or in the cul-de-sac of Douglas. No secondary deposits were to be palpated through the abdomen, and with two exceptions, abdominal fluid was clinically questionable or absent. Of the twenty-eight cases, four had palliative operations for obstructive symptoms; two of these were pyloric, one ileocæcal, and one of the ascending colon. Of the nineteen cases not operated upon, the clinical diagnosis was primary cancer or cancer on ulcer in all but four, and these were diagnosed carcinoma of the liver, and carcinoma of the upper sigmoid. Regarding sex, our series is at variance with some other reported cases as showing a larger percentage of females, namely, ten of twenty-eight cases. The tendency for detached malignant cells to implant themselves upon uterine adnexa was shown by two cases of gastric cancer with secondary malignant ovarian tumors found in the same period. A few cases only showed rectal symptoms of increased constipation during the last few months, and three showed irritable bladder developing. The constipation could hardly have been attributed to the size of the mass; the irritable bladder might have been due to deposits on the bladder wall.

In the series of four hundred and thirty-five cases we found eighteen cases of supraclavicular gland enlargement. Several glands were subjected to microscopic examination, but the majority of patients were refused operation on the clinical findings alone, the supraclavicular glands being the deciding feature. Only two cases showed both supraclavicular and pelvic metastasis. One case showed right-sided, and one right and left sided glandular involvement, and the remainder were left-sided only. These do not include a few cases where we were unable to locate the primary focus.

If the number of cases here reported may be taken as a fair average, then the pelvic deposits are of much more value as a means of decision as to the inoperability of a given case than the supraclavicular metastasis, and by means of pelvic and supraclavicular metastasis more than 10 per cent of the whole shown to be hopeless without exploration. It is only within the last few years that attention has been called to this sign in the current literature by such men as Schnitzler, Kæppeler and Kellog of Germany, Mr. G. Gray Turner of England, and Dr. George Blumer of this country.

Age seems to have little influence as regards whether these warning flags shall be hung in the pelvis or in the shoulder. Both types showed cases in all of the cancer decades.

SUMMARY

1. Rectal examination is absolutely necessary in all abdominal tumors.

2. Of 435 consecutive cases of carcinoma of the upper abdomen six and one-half per cent showed pelvic transplantation deposits as the earliest clinical sign of inoperability. Seven and two-tenths of stomach carcinomas had this sign.

3. Fifty-five per cent more cases were shown to be inoperable through a thorough rectal examination for pelvic metastasis, than because of the presence of supraclavicular gland metastasis.

4. Pelvic metastasis warrants a most unfavorable prognosis as regards life expectancy.

CONGENITAL DIVERTICULA OF THE BLADDER[1]

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THE following study is based upon an interesting case, observed by the author in the early part of the year 1907.

On March 14, 1907, I was consulted by a gentleman 75 years of age for an affection of the bladder, from which he had suffered for nearly ten years. He had been a sickly child up to his sixth year. Later in life he had always been well until his sixty-fifth year. He never had any gonorrhœal or syphilitic infection, but states that all his life he had a peculiar condition of his bladder. Frequently during micturition, the flow of urine would suddenly stop, although the desire to urinate persisted. Upon straining a little he would empty his bladder satisfactorily. His urine had always been clear. About ten years ago he noticed that his urine was bloody at intervals. Shortly afterwards he discovered that he could not empty his bladder completely and that he had to urinate more frequently during the day, and that he was obliged to rise a couple of times during the night. A physician advised him to use the catheter, which he has done ever since. The urine became cloudy and contained mucus. He always has been able to pass a certain amount of urine without the catheter, but he was compelled to use it to "get out what remained," in order to obtain relief. Even after he had emptied his bladder completely, as he thought, a feeling of fullness remained. During the past two years he frequently passed, with much pain, small, hard and softer bodies that he thought were stones.

Status præsens. Patient is a well-built, but emaciated man. His complexion is sallow, the expression of his features denoting a good deal of suffering. Thoracic and abdominal viscera show no abnormalities. Slight arteriosclerosis. He passes water almost every half hour with much pain. Urine ammoniacal, cloudy, containing a trace of albumen, many pus cells, desquamated bladder epithelium, and mucus. He passes about 15–20 cc. at a time. Prostate found not enlarged by palpation per rectum. Bladder cannot be percussed above symphysis, but there is a resistance above the symphysis and towards the right side of the linea alba, which is painful on pressure. No tumor can be palpated. A 23-F. Mercier catheter can be introduced into the bladder without difficulty. There is no stricture of the urethra. Only a few cc. of cloudy urine are withdrawn. In filling the bladder only 35 cc. of fluid can be introduced. In attempting to introduce more, the patient complains of much pain and inability to hold the fluid. Upon pressure over symphysis, no fluid flows from the catheter.

No stone can be felt. A diagnosis of chronic cystitis with contracted bladder and the possibility of a sacculated stone or a congenital diverticulum was made. The probability of the last was considered on account of the peculiar difficulty of emptying the bladder, from which the patient has suffered from early boyhood.

To throw a little more light on the condition, a cystoscopy was attempted, but failed on account of the impossibility to fill the bladder, and its irritability which could not even be overcome by local anæsthesia. I did not deem a general narcosis advisable. Therefore it was decided to do a suprapubic cystotomy to which the patient eagerly assented.

Operation, March 17, 1907, under anæsthol-narcosis. Suprapubic cystotomy. On opening the bladder it was found that its walls were very much hypertrophied.

[1] Read in abstract before the Genito-urinary Section of the New York Academy of Medicine, April, 1909.

The viscus itself was small, its lumen very narrow. The mucous membrane was injected, but everywhere perfectly smooth. There was no hypertrophy of the prostate or stone. Both ureter openings were present. Near the summit of the bladder on its right lateral wall, there was found a round opening with smooth borders about the size of a quarter. The mucous membrane of the bladder was arranged in radiating folds toward this opening which led into a pouch, almost double the size of the bladder itself, its lowest point reaching down into the pelvis. The mucus membrane of this diverticulum was very much inflamed and thrown into an irregular network of trabeculæ, crossing and recrossing each other, giving exactly the picture which we are accustomed to see in a "vessie à clonne" in prostatics. Its walls were very thick, almost thicker than the wall of the bladder proper. The cavity of the diverticulum contained a large amount of amorphous material consisting of urinary sediment and foul-smelling pus and mucus. The mucous membrane of the bottom of the cavity showed here and there small spots of superficial ulceration.

After cleansing the pouch thoroughly, a drainage tube was inserted into the diverticulum and led out through the cystotomy wound. A Witzel fistula was then established. No drainage tube was put into the bladder itself. The condition of the patient did not warrant a radical extirpation of the sacculation. The patient was put to bed and a syphon-drainage established. The convalescence was uninterrupted, the patient being out of bed on the third day p. op. At the beginning, there was some leakage beside the tube, but this soon ceased and the fistula was tight; all the urine from the diverticulum drained into the syphon-bottle. On the third day p. op. patient commenced to void small quantities of urine through the urethra, 30 to 40 cc. at a time. The quantities drained from the diverticulum varied between 1,080 to 2,500 cc. in twenty-four hours.

The after treatment consisted in carefully washing out his bladder and diverticulum through the drainage tube and in the administration of urotropin 0.6 t. i. d. per os.

Patient left the Hospital on the fourth day of April much improved. His constant desire to urinate and his pain had left him and he felt comfortable and satisfied. About one year later patient died of uraemia due to an ascending pyelo-nephritis.

Unfortunately it was impossible to get a post-mortem examination, so that I was not able to procure the specimen. In my mind, there is no doubt but that we had to deal with a large congenital diverticulum of the bladder. This opinion is substantiated by the history of the patient. As long as he remembered he could not empty his bladder completely; the flow of urine would suddenly stop and only after an additional muscular effort this would be accomplished. There was absolutely no obstruction to the flow of urine, either in the urethra or the bladder, as evidenced by the smoothness of the mucous membrane of the bladder, the absence of prostatic hypertrophy and the contracted state of the bladder. This last condition is easily explained by the long standing chronic cystitis. The wall of the diverticulum was undoubtedly composed of all three coats of the bladder. The mucous membrane could be inspected at the operation. The trabeculated condition of this membrane pointed with certainty to an underlying coat of strong muscular fibres, which assumption is further strengthened by the evident thickness of the wall of the diverticulum, which even exceeded that of the bladder wall itself.

A good deal has been written on the subject of diverticulum of the bladder, but except the report of single cases scattered through the literature, there exists no comprehensive study of this condition. Only in the French literature is found an excellent and thorough study in the thesis of Alcée Durrieux, who up to 1901, besides his own case, collected 194 observations. In Germany Pagenstecher, Englisch, and Wagner have contributed to our knowledge. In our English literature no comprehensive paper exists. If one reviews the literature, one is struck by the fact that a diagnosis of this condition during life has rarely been made, not because it is impossible to do so, but for the reason that this anomaly is rarely thought of. It is obvious that this has led in many cases to unfortunate results for the patient. Considering the various and serious complications that may arise and eventually, if not properly treated, cause the death of the afflicted, one realizes the necessity and importance of an early accurate diagnosis.

Definition. Diverticulum, double bladder, bladder-cells, cysts of the bladder, saccules, sacs, pouches, false bladder, are terms that are used to designate an abnormality of the bladder, consisting of a receptacle of varying capacity, connected with the bladder by an orifice of variable diameter. These terms were used formerly interchangeably, without a clear or definite conception of the pathological condition to be designated. But in late years, since the pathology of these extra-vesical cavities has been studied more closely, it has been found that their origin and causative factors differ so widely that it was necessary to establish a definite nomenclature in order to avoid confusion. A perivascular abscess breaking through into the bladder and a protrusion of mucous membrane through the interstices of the muscular wall have the same end-effect in producing an extra-vesical cavity

connected with the bladder, although their mode of production is essentially different. In the older medical literature we find cases reported by Rauling, Riolan, Blasius, and Collot as "double bladder" which undoubtedly were nothing else but large diverticula. Even as late as 1863 Michele Scibelli describes a case of congenital double bladder with a very much dilated lower end of the right ureter as a triple bladder.

Morgagni was probably the first one to recognize the true nature of diverticula. He attributes the formation of diverticula to a hypertrophy of the bladder wall, the true cause of which is, in his opinion, hypertrophy of the prostate.

During the last century, Tenon, Morgagni, Houstet, and Chopart were the first to show the true significance of these cavities in connection with the bladder. Since that time the mode of formation, character, and symptoms of diverticula have been carefully studied. The first one to propose the theory that diverticula were formed by a hernia of the mucosa through the muscular coat was Cruvelhier. He named this condition "hernie tunicaire." The important distinguishing sign of these diverticula is the fact that they have *no muscular coat.* But Mercier, Civiale, Cruvelhier, and Robelin were able to demonstrate muscular fibres in certain diverticula. Virchow, Birch-Hirschfeld also found muscular fibres. Therefore a division was necessary into *congenital* diverticula *with musculosa* and *acquired* diverticula *without muscular coat.*

According to Durrieux, the definition of diverticula is the following: Diverticula are certain cavities in close connection with the bladder which are due to an expansion of a portion of its walls. They are characterized by: 1. The presence of an opening which is clearly defined, forming the communication between the cavity of the bladder and that of the diverticulum. 2. By an absence of an ureteral opening. 3. By a mucous lining which is continuous with that of the bladder and covers its whole inner surface.

J. Englisch, who has studied and written a good deal about these anomalies, distinguishes the following types:

1. The divided bladder: *a.* By a vertical septum. *b.* By a horizontal septum, away from the opening of the urachus.

2. Diverticula of the bladder: *a.* True diverticula, containing mucosa and muscularis; *b.* False diverticula, consisting only of mucosa, the "hernie tunicaire" of Cruvelhier.

The divided bladder and the true diverticula are congenital; the false diverticula are always acquired.

1. THE DIVIDED BLADDER (*Vesica bipartita, Vesica duplex*)

Before I speak about this congenital anomaly, I must refer shortly to the embryological development of the bladder. Until recently it was assumed that the bladder was composite in origin, its upper part being developed from the allantois alone, while in the formation of the trigonal region both allantois and cloaca take part. The allantois is developed from the caudal pole. Ultzmann [1] thinks the double bladder is formed by a failure of the two halves of the allantois to unite. In this case two cavities are formed, in each of which one ureter opens.

This view cannot be upheld any longer. According to the investigations of Lieberkuehn, Keibel, Retterer, and Reichel,[2] the bladder, at least its lower segment and the central portion of the urethra, are developed from the anterior half of the cloaca itself. The allantois plays little part in the formation of the bladder. We know now that the allantois in the human being is imperfectly developed and has relations to the urachus only.

Pagenstecher [3] distinguishes two types of the double bladder. The first type shows a division of the bladder into two cavities by an anteroposterior partition or a constriction. Fuller [4] reports two cases. The accompanying figure 1 illustrates the condition. The patient was a man 44 years old who had bladder symptoms since early life. He acquired gonorrhœa several times with a consequent stricture. Chronic retention of urine. Albuminuria, uræmic symptoms. Perineal section.

[1] Ultzmann. Krankheiten der Blase.

[2] Reichel. Die Entstehung der Missbildungen d. Blase und der Harnroehre. Arch. f. Klin. Chir., bd. 46.

[3] Pagenstecher, E. Angeborene Blasendivert. und Doppelblasen. Arch. f. Klin. Chir., bd. 74, 1905.

[4] Fuller. Anteriosubdivision of Bladder. An important anomaly. Jour. Cut. and Gen.-Urin. Diseas., Dec., 1900.

A small stone was removed from the lower, smaller cavity. Suprapubic cystotomy. Division of stricture. Death after ten days.

The other patient was a man 55 years old who had urinary trouble since his childhood; frequent and painful micturition. When 25 years old he noticed difficulty in emptying his bladder. He came under observation when 55 years old with augmentation of his symptoms and hæmaturia. The bladder seemed dilated. Attempt at catheterization caused hæmorrhage, therefore a perineal section with drainage of the bladder was done. After 10 days the drain was removed, which was followed by a renewed retention. The examining finger finds a mass blocking the outlet of the bladder, which feels like bladder wall. On suprapubic section the anomaly is detected and the narrow communication incised. Drainage. Cure.

In both these cases the horizontal dividing wall was situated in front of the ureteral openings so that the urine was emptied first into the upper and posterior compartment. The anterior and lower compartment had a capacity of 1–1½ ounces and had thick walls. The posterior cavity was larger and similar to the bladder cavity proper. The two compartments were joined by an oval opening admitting two fingers. In the first case the opening was circular and admitted the tip of the index finger. *The dividing wall had the thickness of a double hypertrophied bladder wall.*

This type is best designated as *congenital hourglass bladder.*

We find an analogy of this condition in different congenital strictures, valve and fold formations of the urinary tract as well as in the strictures and artresias of other hollow organs, i. e., intestinal tract (the congenital hourglass stomach, etc.).

The bladder is made up of two parts which differ embryologically from each other. The upper portion with folded mucous membrane, the urine reservoir proper, and the smooth trigone. The latter, according to Kalischer, belongs to the urethra. The upper part of the bladder is developed at an earlier period than the trigonal region. If development of upper and lower part does not take place in the proper proportion a constriction between the two will be the result, which becomes permanent.

Another case that belongs into this class is reported by Detwiler.[1] Man 69 years old, suffered from urinary symptoms for three or four years. Development of scrotal abscess with urinary fistula. Stricture of the urethra. Death from exhaustion. At autopsy the bladder was found much thickened and enlarged. All over its internal surface small sacs and pouches (20 to 30), from the size of a wheat grain to that of a walnut were found. *The bladder was almost divided into two compartments by a contraction in its center, which caused it to resemble an hourglass.* At the top of the upper cavity was a pouch of walnut size. The opening between the two principal sacs was just large enough to admit the point of the index finger. In conclusion the author states: "I can hardly account for the large pouch on top. I hardly think it could have formed that way (i. e., like the small pouches), as it was almost as large as the lower end of the hourglass and had quite thick walls (much thicker than some of the smaller sacs)."

A similar condition was found in Cutters' case[2] in a boy of 11 years, who died from a perforation, with consecutive peritonitis, of an ulcer situated in the upper compartment.

The dividing constriction between the two cavities may lie above or below the entrance of the ureters into the bladder. Pagenstecher believes that the development of this anomaly dates back as far as the fourth week. (Embryo of 7 mm.)

The second type is shown in Figures 2 and 3, the first corresponding to the condition in the male, the second corresponding to the condition in the female. In these instances two organs are present (a true duplicated bladder). The septum which divides the two bladders reaches at least down to the trigone. Both empty either into a common urethra (in males) or each has a separate urethra (in females). The two organs are very often separated from each other by a furrow into which a fold of the peritoneum dips. This furrow is often occupied by coils of intestines. Each bladder has usually one ureter. With very few exceptions in all the cases reported there were

[1] Detwiler. An hourglass bladder, having many sacs, etc. Va. Med. Month., vol. xv, page 644.

[2] Cit. after Englisch. Isolierte Entzuendung d. Blasendivert. und Perforations peritonitis. Arch. f. Klin. Chir., bd. 73. 1904.

found other anomalies: bicornate uterus, double uterus and double vagina, artresia ani, etc. In Schatz's case [1] there were found two uteri, two vaginæ. Each bladder is in communication with one vagina. The ureters were wanting and the kidney showed cystic degeneration. Gleiss (loc. cit.) reports a case of a female child with two anal depressions, two anal furrows, double labia majora, vagina, urethra, and bladder. On incising the left anal furrow, the gut was encountered at a depth of 3 cm. and showed a distinct and completed septum, allowing of no communication between right and left rectum. Lange's case (loc. cit.) presented a double penis, artresia ani, double raphe of the scrotum, two anal folds, two anal depressions. Also a double urethra, double bladder, each with one ureter. There were two fistulæ coming from the blind rectal pouch each emptying into one of the urethræ. In Volpe's case (loc. cit.) there was a double colon, the right one emptying itself into the right bladder, the left one into the left bladder. There was a horseshoe kidney present with only one ureter. The penis consisted of two corpora cavernosa. There was also found a diastasis of the symphysis pubis. All these cases were children who were stillborn, or died very soon after birth.

Different theories have been advanced to explain these anomalies. The old theory that a duplication or a division of the allantois is responsible for them must be discarded in the light of our modern embryological views. Reichel (loc. cit.) thinks that the malformation is brought about at a time when the primitive cloaca and the genitourinary sinus begin to be separated by the two Rathke's folds. According to the latter author this takes place in the following fashion: On either side of the gut, at the point where it enters the cloaca, there are developed projections or folds, the so-called "Rathke's folds." (Fig. 8, RF.) These two folds produce three depressions on the dorsal wall of the cloaca. The median one (Fig. 8, D) constitutes the direct prolongation of the gut, the two lateral ones (Fig. 8, W) are prolongations of the Wolffian ducts which enter the cloaca higher up. The two Rathke's folds grow downward and eventually blend in the median line (Fig. 9, RF), thus forming a closed channel, the rectum, and separating the urogenital sinus from the gut. If these folds should in some way or other grow to such an extent as to reach the anterior wall of the urogenital sinus (as indicated by the dotted line), it is easily conceivable that two distinct cavities are formed.

This theory would, however, not clear up the origin of those cases where a double rectum, vagina, and penis are found. Pagenstecher therefore assumes that these malformations must have originated at a very early period of embryonal life when a differentiation of the parts had not as yet been effected. They are the result of a duplication of the whole urogenital system, both of entoblastic and ectoblastic origin.

We come now to that form of congenital malformation of the bladder which is more important to us clinically than the foregoing, the so-called congenital diverticula.

2. THE CONGENITAL DIVERTICULA OR VESICA BILOCULARIS

The cases that belong to this class have one feature in common, namely, the bladder is divided into two compartments by a septum which is situated not in the median line but mostly a little towards the left. In the great majority of cases this septum runs in a vertical direction from before backwards, but it may also be found to run obliquely from above downward and in a transverse direction, so that the bladder is divided into a lower and an upper part.

The walls of this septum consist of two bladder walls which are in close apposition and which are made up of muscularis and mucosa. Viewed externally such a bladder does not show any constriction or furrows to indicate the site of the septum. ***Both ureters empty into the main bladder.*** The two cavities communicate with each other by a circular or an oval opening of varying size. This may be so small as to hardly admit a small sound or large enough to admit the tip of a finger. This opening may be located in the middle of the septum, but more often it is found nearer its upper or lower border. The position of this communication is of some importance. The

[1] Cit. after Pagenstecher.

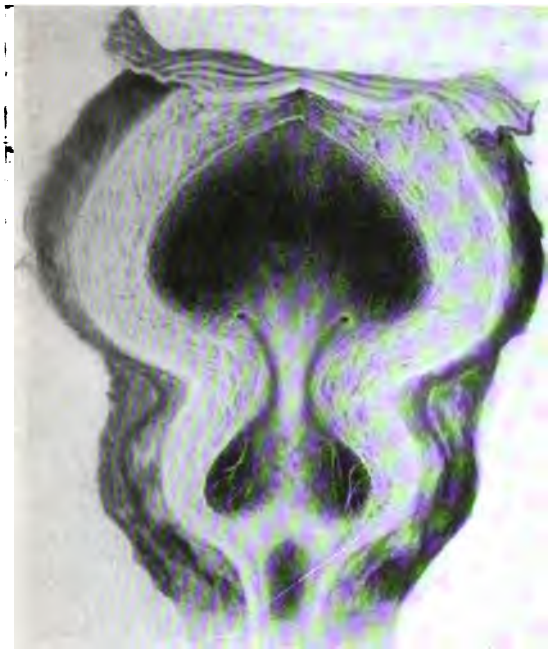


Fig. 1.

higher it is placed the more difficult it will be for the urine to flow back into the main compartment and to be emptied through the urethra.

This form of congenital diverticula is represented by a case reported by Huppert and by the author's case. (Fig. 10.) In Huppert's case the diverticulum was placed on the left side and its opening was in the middle, whereas in the author's case, the diverticulum was situated on the right side and the opening was placed high up towards the vertex. These diverticula are sometimes also found double, one on either side, as described by Durrieux. (Fig. 11.) A rare form of diverticulum is reported by Juetting. This author describes a preparation from the pathological collection of Muenster, Germany. Girl, one to two years old. The bladder shows a septum three finger breadth long, two finger breadth wide. It does not lie in the median line but towards the left. There are found four ureters; two of them empty themselves into the right half of the bladder, the third ureter runs through the posterior wall of the bladder and the septum and empties itself into the right half, the fourth ureter enters the left part of the bladder.

In the foregoing two forms of congenital malformations of the bladder, the two cavities are closely joined together. There are, however, types in which the diverticulum is more or less separated from the bladder proper, so that its walls are more or less distinct. Sometimes the diverticulum is joined to the bladder by a more or less pronounced neck. If such specimens are not examined carefully, they may be confounded with simple acquired diverticula that consist merely of a prolapse of mucous membrane through the muscular coat. The majority of these diverticula are formed on the left side, and they lie most frequently behind the bladder and in the hollow of the sacrum. The bladder proper is therefore pushed upwards and towards the right. They are rarely covered to any extent by peritoneum.

The mouths of the diverticula are for the most part situated in the neighborhood of the ureters. Most frequently they are found a little above and towards the lateral walls of the bladder. Very often we see that the mucous membrane of the bladder is arranged in radiating folds running towards the opening. This is brought about by a sphincterlike arrangement of the muscularis of the bladder. In some of the cases a sphincter action of these openings could be clearly demonstrated, as in the cases reported by Pagenstecher, Czerny, and Zacharisson.

Sometimes the opening of the diverticulum lies at the site of the ureter. In such cases the ureter opens into the diverticulum, notwithstanding Durrieux's opinion to the contrary. The relationship of ureter and diverticulum is of great importance. If two ureters exist, they both empty into the main bladder

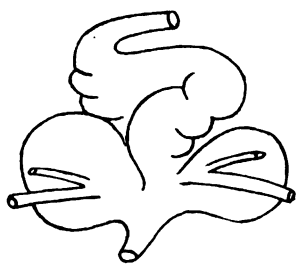
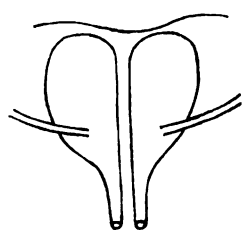
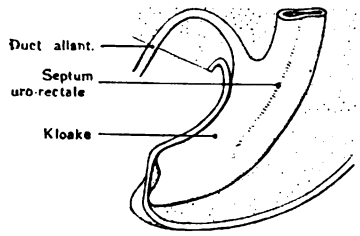


Fig. 2.



after Pagenstecher.

Fig. 3.



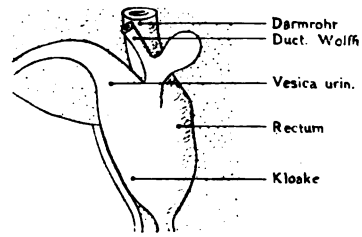


Fig. 4. Fig. 5.

Development of the bladder (after Kollmann)

which also contains the trigone and the urethral exit, or one ureter empties into the right cavity, the other into the left one. If more than one ureter are present, two of them are in connection with the main bladder, one may pierce the septum and the fourth may be in connection with the diverticula (case Juetting).

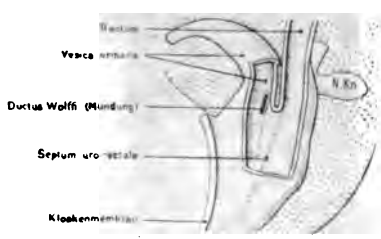
In some cases the ureter is in such close connection with the diverticula, running along its posterior wall that during extirpation it must be cut and reimplanted into the bladder wall (case Czerny).

The urachus is mostly single and in connection with the main bladder.

How can we explain the formation of these congenital diverticula?

Englisch and some other writers believe that the formation of congenital diverticula is based upon the presence of some obstacle to the outflow of the urine, in consequence of which the weak points of the muscular arrangement of the bladder give way (Fig. 12). These obstacles may be produced by inflammatory conditions of the bladder or urethra, during intrauterine life, but which have healed out leaving no vestiges after birth. After Englisch the opposing epithelial layers become agglutinated during embryonal life, occluding the urethra. This occlusion is relieved at a later date by the back pressure of the secreted urine. This theory would, however, explain only the type represented by Fig. 11, but would not explain the type of diverticula which are formed by a vertical or a horizontal partition. In my opinion the formation of the congenital diverticula and the bilocular bladder can best be explained by the theory of Pagenstecher, who holds that they are produced by a folding in of the bladder wall, brought about by a superfluity of embryonal tissue which has to accommodate itself to a certain space in pelvis.

Pathology. The presence of a diverticulun of the bladder is always followed by certain pathological changes in the bladder and the diverticulum itself. The first and most important is a hypertrophy of the bladder wall. This is a very interesting condition, as the usual cause for hypertrophy, an obstruction at the outlet, is not present. How, then, can this hypertrophy be explained?



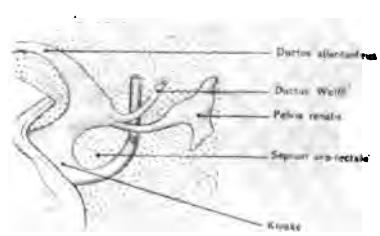


Fig. 6. Fig. 7.

Development of the bladder (after Kollmann)

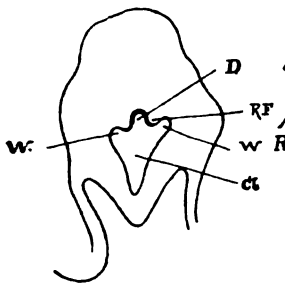


Fig. 8.

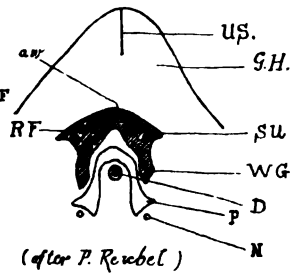


Fig. 9.

Rehfisch, in his experiments (Ueber den Mechanismus des Harnblasenschlusses und der Harnentleerung) arrives at the following conclusions: 1. During the emptying of the bladder, the pressure in the cavity of the bladder falls and the organ expels its contents. If a diverticulum exists, this empties its fluid into the bladder at the same time. There is, therefore, an additional quantity of urine which the bladder muscle has to expel, in consequence of which the muscle must hypertrophy, in order to do the extra work thrown upon it. 2. At the beginning of micturition the pressure in the cavity of the bladder *does not fall*, but the contractions of the bladder are so vigorous that the pressure rises. Thus, the urine is forced out of the bladder into the diverticulum, putting its walls under higher pressure. If now the pressure in the bladder falls, a perfect equilibrium in diverticulum and bladder cannot be restored. The detrusor muscle having reached its highest point of contraction and the sphincter of the bladder being closed, before the diverticulum has had time to rid itself of the surplus of urine, there will always remain a residue of diverticular urine in the bladder. The musculature of the bladder with each contraction has to cope with more fluid than is actually expelled with each micturition. This means more muscular work, therefore hypertrophy.

Refisch very aptly compares these conditions with the mechanism of hypertrophy of the heart in valvular disease. Type 1 would correspond to stenosis of an arterial ostium, type 2 to the insufficiency of a valve.

The diverticulum is therefore the primary cause of the hypertrophy of the bladder.

The diverticula are often the seat of grave pathological changes. The mucous membrane becomes inflamed through the irritative presence of decomposing urine. This inflammation may go on to a complete gangrene of the mucous membrane, or even of the muscularis with perforation into the peritoneal cavity and subsequent purulent peritonitis. Englisch has published and collected a large number of such cases. The development of stones in the diverticula is frequent.

Symptomatology. Congenital diverticula of the bladder may be present for a long time, before they give any signs of discomfort. Some patients state that they have suffered from "a weak bladder" as long as they can remember other patients only experience symptoms for a short time. The main symptom in all is frequent micturition at the outset. Later this is accompanied by pain. This pain may be situated in the abdomen, where it has the character of pressure or fullness, or it may only appear as a burning and stinging sensation during and at the end of micturition. After urinating there is in most cases a feeling as if the bladder was not completely emptied and the desire to urinate persists, or comes on again shortly after voiding. Some patients suffer from complete retention earlier or later in life. This complete retention may even be the first symptom of the anomaly. The urine becomes cloudy and contains mucopurulent material.

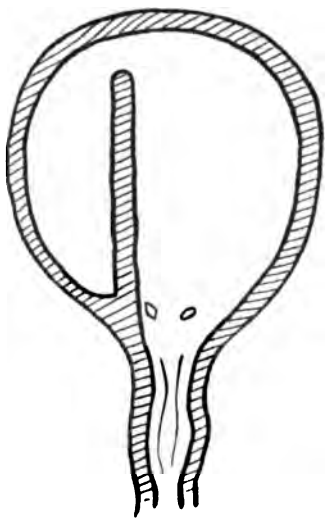


Fig. 10.

Fig. 11.

On and off hæmaturia may be present. These pathological findings make their appearance as soon as the urine in the diverticulum stagnates and commences to show ammoniacal fermentation. Then all the symptoms are aggravated. Stones may develop in the diverticulum and add to the misery of the patient. If the kidneys become implicated, as they very often are, in the later stages of the disease, symptoms of pyelitis and pyonephrosis may develop with septic temperatures, an attack of uræmia finally closing the tragedy.

On examination there is often found a tumor above the symphysis on either side of the bladder. Or, if the diverticulum lies behind and below the bladder, a tumor that fills the hollow of the sacrum may be palpated per rectum or vagina. If a catheter is introduced into the bladder, a larger or smaller quantity of urine is withdrawn; if pressure be exerted over the tumor an additional amount of urine is obtained, often of a different character and in large amounts, one quart and more is not infrequent. This is the residual urine contained in the diverticulum. As soon as the residual urine is removed the tumor will disappear.

Where a cystoscopic examination is possible, the entrance into the diverticulum may be seen as a dark hole of varying size into which under favorable conditions the cystoscope may be passed and the interior viewed and the presence of possible stones noted. (Fig. 13.) The picture which presents itself is usually so characteristic that it can hardly be mistaken for anything else. Under certain conditions, however, it may be extremely difficult to distinguish between the mouth of an ureter and the opening of a diverticulum. This is the case when the diverticular opening is of small size. The openings of the diverticula are very often near the mouth of the ureters and in such cases the question may arise, whether we have to deal with a supernumerary ureter or with an opening of a diverticulum.

Tilden Brown and Osgood have used a very ingenious method to make the diagnosis with certainty. They introduced into the questionable opening a ureter catheter armed with a stylet and had an X-ray picture taken. The plate showed the catheter coiled up in a cavity. thus demonstrating with certainty that they had to deal with a diverticulum. Through the kindness of Dr. Tilden Brown I have been enabled to reproduce his Roentgen picture here. (Fig. 14).

Treatment. The treatment of this condition may be *conservative*, or *palliative*, or *radical*. There are cases reported which have been made comfortable for years by careful catheterization

Fig. 12.

Fig. 13.

with the subsequent flushing of the bladder with various weak antiseptic solutions. Besides the local treatment the patient should have benzoic acid and urotropin internally with a liberal allowance of some indifferent table water. His general condition should be improved by diet and hygienic measures. By these means the patient may be kept in fairly good condition. As the presence of a diverticulum, however, is always a grave menace to life, operative treatment should strongly be urged upon the patient. There are different operative procedures at our disposal. For the sake of simplicity I shall divide them into *palliative* and *radical operations*.

Suprapubic cystotomy, as a palliative meas-

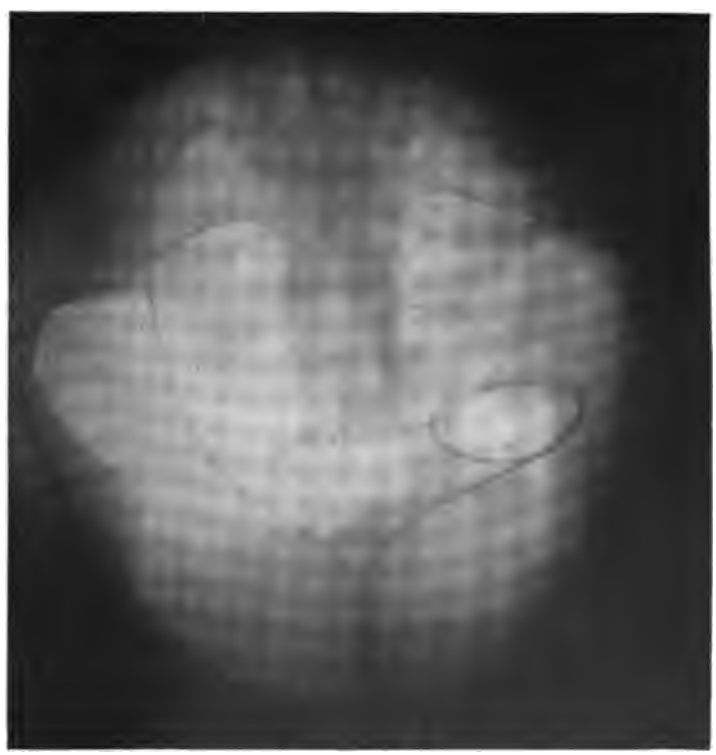


Fig. 14.

ure, has been resorted to in a number of cases. This operation was undertaken either as a diagnostic measure, because the actual pathological condition was not clear, or because the condition of the patient was such that a removal of the diverticulum was too hazardous. Wulff and Pagenstecher employed suprapubic drainage as a preliminary step and extirpated the diverticulum at a secondary operation. Langer in his cases besides drainage dilated the orifice of the diverticulum. Zacharisson, Lennander, and Young destroyed the septum between the diverticulum and the bladder and Ljungren established a large communication between diverticulum and bladder after the fashion of a gastroenterostomy. This method seems rational and has been followed by good results, but it does not remove the sac, although the conditions for emptying the diverticulum are improved. Extirpation of the diverticulum, if the condition of the patient allows it, is the operation of choice. It has been employed by Wulff, Czerny, Pagenstecher, Wagner, and Young. All cases treated by this method were cured. Pean extirpated the mucous membrane only and effected a cure.

According to the location, there are different ways of operative procedure. For those diverticula which lie on either side of the bladder or which are situated at the vertex, the suprapubic extraperitoneal route should be selected. In cases where the diverticulum lies below and behind the bladder the sacral route with temporary resection of the sacrum is the best. This last method was employed by Pagenstecher with good results.

Mortality. The mortality from congenital diverticula is very high. Of the forty-eight cases collected from the literature which were treated with and without operation, thirty-two died, total mortality 66.7 per cent. There were twenty-eight cases operated on, of these ten were cured. One improved, and eight died, 40 per cent mortality. Six of these patients were subjected to primary or secondary resection; all of them recovered and were cured. Eleven patients were treated by suprapubic cystostomy with drainage of the bladder with three cures, one improvement, and six deaths. In one the mucous membrane of the diverticulum was excised (Pean) with cure.

In twenty-eight patients an operation was not done, either on account of their poor condition or because the diagnosis was not made. Of these twenty-four died, 84.3 per cent mortality. In three patients in which the diagnosis was made the outcome is not known. One patient died of typhoid fever and the diverticulum was found at the autopsy table. *The best results, therefore, are obtained by radical extirpation,* if the diagnosis is made at a time when the patient's general condition is still a fairly good one.

Sex. The disease is most frequently found in men, the ratio between the sexes being about ten to one (males 41, females 4). Among the cases collected there were also two children in which the sex was not mentioned and one fœtus.

Age: 1 to 10 years old	4
10 to 20 years old	3
20 to 30 years old	2
30 to 40 years old	9
40 to 50 years old	4
50 to 60 years old	6
60 to 70 years old	7
70 to 80 years old	2

One was a fœtus. Two patients were stated as "old man," and in eight the age was not given. The table shows that in the majority of cases urgent symptoms most often appear in the third, fifth, and sixth decennium. It seems that in a good many cases the diverticulum was borne with comparatively little discomfort until another pathological process was added. This may be a gonorrhœa with or without stricture (Czerny, Huldschiner, Hagemann, Young), a prostatic hypertrophy (Huppert, Paltauf, Chopart, Bonnetus), or the development of a stone (Langner), or the infection of the bladder by catheter or through autochtonous infection of stagnating urine.

COLLECTED CASES

1. WULFF. Male, 34. One diverticulum on right lateral wall. Treatment: Suprapubic cystotomy, secondary extirpation. Result: Cure, residual urine, 150-200 cc.
2. MEYER. Male, 43. One diverticulum on right lateral wall. Complications: Both ureters dilated. Result: Death. Diverticulum smooth; trabeculated bladder.

3. CZERNY. Male, 31. One diverticulum on left side. Complications: Stricture of urethra. Pyelo nephritis. Treatment: Extirpation. Result: Cure. Later nephrectomy.
4. HOFMOKL. Female, 56. One diverticulum on left side. Result: death.
5. WRIGHT. Male, 38. One diverticulum on right side and behind bladder. Treatment: Suprapubic cystotomy, drainage. Result: Death.
6. STRAUSS. Male, 29. Two diverticula on right and left sides. Treatment: Suprapubic cystotomy, drainage. Result: Cure.
7. LANGER. Male, 38. Frontal septum, bilocular bladder. Treatment: Suprapubic cystotomy, dilatation of diverticular opening. Result: Death.
8. LANGNER. Male, 6. Bilocular bladder. Complications: Stone in one cavity. Result: Death.
9. HUPPERT. Male, (1). Bilocular bladder. Result: Death from typhoid.
10. HULDOCHINER. Male, (1). One diverticulum on vertex of bladder. Complications: Gonorrhœa. Treatment: Dietetic. Probably a non-obliterated urachus.
11. HAGEMANN. Male, 50. One diverticulum on left side. Complications: Urethritis. Treatment: Conservative. Suffered since his fifth year.
12. PEAN. Female, 15. One diverticulum anterior to bladder. Treatment: Excision of mucous membrane. Result: Cure.
13. MACKINDER. Male, 54. Bilocular bladder. Result: Death.
14. DETWILER. Male, 69. "Hour glass" bladder. Complications: Left pyonephrosis. Dilatation of ureters. Stricture of urethra. Cystic kidney. Result: Death.
15. KOLLOSSOW. Male, 40. Bilocular bladder. Result: Death. Right kidney with two pelves.
16. ZACHARISSON. Male, 1¾. One diverticulum on left side. Complications: Left pyonephrosis. Phimosis. Retention of urine. Treatment: Suprapubic cystotomy, destruction of septum. Result: Death. Left kidney with two ureters.
17. PAGENSTECHER. Male, 33. One diverticulum on right side. Treatment: Suprapubic cystotomy, extirpation, implantation of ureter. Result: Cure.
18. WAGNER. Male, 48. One diverticulum on right side. Treatment: Extirpation and suture. Result: Cure.
19. WAGNER. Male, 80. Diverticulum on right side behind bladder. Result: Death. Autopsy findings by Paltauf.
20. WAGNER. Male, 55. Complications: Pyelitis, chronic. Dilatation of ureters. Result: Death. Autopsy findings by Paltauf.
21. WAGNER. One diverticulum on right side. Complications: Dilatation of bladder. Result: Death. Autopsy findings by Paltauf.
22. CHOPART. Male, old. Bilocular bladder. Complications: Prostatic hypertrophy. Stricture of urethra. Result: Death. Many small false diverticula.
23. PETIT. Male, old. One diverticulum behind bladder. Complications: Gangrene of mucous membrane, Result: Death. Several smaller false diverticula.
24. CADGE. Female, 61. One diverticulum on right side. Complications: Gangrene of mucous membrane, peritonitis. Result: Death. Two false diverticula.
25. LJUNGREN. Male, 12. One diverticulum behind bladder. Treatment: Suprapubic cystotomy. Communication established between bladder and diverticulum. Result: Cure.
26. BONNETUS. Male, 57. One diverticulum on left side. Complications: Prostatic hypertrophy. Mucous membrane of diverticulum ulcerated. Result: Death.
27. LE ROY D'ETIOLLE. Male, 65. One diverticulum behind bladder. Complications: Perinephritic abscess. Dilatation of ureters. Treatment: Catheter à demeure. Result: Death.
28. CUTTER. Male, 65. Bilocular bladder. Complications: Peritonitis following perforation. Result: Death.
29. ENGLISCH. Male, (1). One diverticulum on right side. Treatment: Suprapubic cystotomy. Result: Death.
30. YOUNG. Male, 47. Seven diverticula on right and left sides, anteriorly. Treatment: Catheterization. Result: Death.
31. YOUNG. Male, 30. Two diverticula on right and left sides. Complications: Gonorrhœa eleven years ago. Treatment: Extirpation. Result: Cure.
32. YOUNG. Male, 34. One diverticulum on vertex of bladder. Treatment: Extirpation. Result: Cure.
33. YOUNG. Male, 22. One diverticulum on left side. Complications: Dilatation of ureters. Stricture of urethra. Treatment: Dilatation of stricture. Result: Death.
34. FISCHER. Male, 65. One diverticulum on right side. Treatment: Suprapubic cystotomy. Drainage. Result: Improved. Death one year later from ascending pyelonephrosis.
35. CIVIALE. Male, 60. One diverticulum on vertex of bladder. Result: Death.
36. CIVIALE. Male, (1). Two diverticula on right and left sides. Complications: Slight prostatic hypertrophy. Result: Death.
37. BURCKHARDT. Male, 34. One diverticulum on right side. Complications: Pyelonephritis. Treatment: External urethrotomy. Result: Death.
38. CIVIALE. Male, 38. Three diverticula, two on vertex of bladderand one behind the bladder. Treatment: Catheter à demeure. Result: Death.
39. LIONVILLE. Female, (1). Two diverticula on right and left sides. Result: Death.
40. FLEURY. Child, 8. One diverticulum. Complications: Calculus in diverticulum. Treatment: Perineal cystotomy. Result: Cure.
41. BUCKSTONE BROWN. Child, 3. One diverticulum in hernial sac. Complications: 2 calculi in diverticulum. Treatment: Suprapubic cystotomy. Result: Death.
42. CABOT. Male, 57. Two diverticula on right and left sides. Complications: Calculi in diverticulum. Pyelonephritis. Result: Death.
43. MERKEL. Fœtus. One diverticulum Result: Death.
44. FRANK. Male, old. Bilocular bladder. Result: Death. One ureter for each cavity.
45. MENDOZA. Male, old. Bilocular bladder. Complications: Calculus in each cavity.
46. ALBARRAN. Male, (1) One diverticulum. Treatment: Suprapubic cystotomy. Result: Death.
47. GUYON. Male, 68. One diverticulum on right side. Complications: Dilatation of ureters. Prostatic hypertrophy. Calculus.

48. DURRIEUX. Male, 60. Two diverticula on right and left sides. Complications: Prostatic hypertrophy. Treatment: Suprapubic cystotomy and drainage. Result: Death.

NOTE—Nos. 38 to 48 cited after DURRIEUX.

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POSTURAL TREATMENT AND LAVAGE OF THE RENAL PELVIS FOR THE RELIEF OF PYELITIS OF PREGNANCY[1]

BY PAUL MONROE PILCHER, A. M., M. D., BROOKLYN, NEW YORK

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FEW men in writing upon the subject of pyelitis in pregnancy make any distinctions between the lesions of pyelitis, pyonephrosis, suppurative nephritis, and pyelonephritis. These four conditions represent very distinct lesions which, as a rule, are characterized by different symptoms and call for radically different methods of treatment. In the present report the writer will not consider the suppurative infections of the kidney which have been present before pregnancy and whose presence has been emphasized by gestation and excited into renewed activity, but this report will include only those cases in which the patient enters upon her period of pregnancy with a perfectly healthy kidney and during the course of her gestation is seized with an attack of acute suppurative inflammation of the pelvis of one or both kidneys.

[1] Read before the Brooklyn Gynecological Society, April, 1909.

True pyelitis of pregnancy is an acute catarrhal inflammation of the pelvis of the kidney, which occurs suddenly during the course of a normal pregnancy, is acute in its onset, usually unilateral, affecting more frequently the right than the left kidney, running an acute course, and tending to spontaneous recovery without permanent injury to the kidney. Pathologically, there is a dilatation of the pelvis of the kidney with inflammation of its lining membrane and some congestion of the parenchyma of the kidney, causing an enlargement of that organ, with engorgement; at first the parenchyma is not invaded by the pathological process.

The occurrence of the disease I believe to be much more frequent than has formerly been supposed, for in the past six months seven cases have come under my care, exclusive of all the cases in which there has been a history of previous inflammation of the kidney prior to the pregnancy. Vineberg, in his paper on "Pyelitis in Pregnancy and the Puerperium," published in the American Journal of Obstetrics for June, 1908, was able to collect only one hundred and twenty-three cases from the literature of this disease, but as this included a number of cases of puerperal pyelitis, the actual number of reported cases would be less than this.

As to the relative frequency of pyuria in pregnant women, the Copenhagen Maternity Hospital Reports show that as a result of careful urinary examinations in over seven thousand cases, pus was found present in the urine in only six per cent; and in the majority of these cases the pus was due to inflammation of the bladder.

There has been much discussion as to the cause of this acute inflammation of the pelvis of the kidney, and the view has now become generally accepted that it is due to pressure upon the ureters by the pregnant uterus. This theory has received considerable support from the observations of Cruveilhier, who made a careful study of the condition of the ureters in pregnant women, and at autopsy he found that the ureters were markedly dilated in all the women who died after confinement or during the latter months of pregnancy. It is rather difficult, however, to understand how the uterus could be the sole etiological factor in those cases which occur during the earlier months of pregnancy, in one case of my own it having occurred at the third month.

From my own studies I would conclude:

First. That a few cases were brought about by toxic influences and hæmatogenous infection in a kidney, whose vitality has been lowered owing to the occurrence of a pregnancy; this is probably the cause in pyelitis occurring in the earlier stages of pregnancy. (See case No. 2.)

Second. That from the appearance of the bladder as viewed from within, it would seem very probable that the distortion of the vesical portion of the ureter (due to the presence of an enlarging uterus) could easily cause an obstruction to the free flow of urine into the bladder and favor a catarrhal inflammation of the ureter and pelvis, the infection being either hæmatogenous or by direct extension from the bladder. In some cases it has been observed by the writer that the bladder was compressed from above, downwards, by the pregnant uterus, so that the ureter was made to bend sharply at the point of its entrance into the bladder, or was kinked in its course through the bladder walls (as in case 1). In other cases the bladder is flattened from before, backwards, also offering possibility of distortion of the ureter.

Third. That pressure and distortion of the ureter above the brim of the pelvis, due to the enlarging uterus after the sixth month, is a frequent contributing cause.

SYMPTOMS. The usual history is that of a woman, pregnant from the fourth to the eighth month, whose previous history has been perfectly normal, when without discoverable cause, or from exposure, during the night or when rising, is seized with severe, cramp-like pain referred to the abdomen; there is usually a slight chill, with nausea and vomiting; the pain recurs, is persistent and usually localizes either in the bladder or in the region of one of the kidneys. It is to be remarked, in passing, that frequently all the pain is referred to the bladder; there is a sharp rise in temperature and the patient feels decidedly ill. Urination increases in frequency, becomes painful, and oftentimes the call for relieving the bladder is

almost continuous; the chill, with rise of temperature, is repeated, and the patient has recurrent pains in the region of the kidney lasting for a few days; *the blood examination* shows the typical picture of a suppurative process; usually a disproportionately large percentage of polymorphonuclear cells, generally above 85 per cent and many times above 90 per cent; *the urine* is usually acid and contains pus in varying quantities; the muscles of the abdomen protecting the region of the affected kidney show spasmodic rigidity; and pressure, especially in the costovertebral angle, causes pain; the kidney is swollen, and if the uterus is not too large the kidney can be palpated.

Cystoscopic examination reveals, usually, the bladder moderately inflamed, otherwise normal excepting for the pressure upon it of the pregnant uterus; and the catheterized specimens from the kidneys will show pus mixed with urine from one kidney, while that collected from the other is normal excepting that it generally shows a large number of granular renal epithelium cells present, and the mucous membrane of the healthy ureter and kidney bleeds more easily than that of the diseased side.

In an uncomplicated case, the temperature gradually drops after five or six days, and in the course of two weeks becomes normal; the secretion of pus from the pelvis usually lasts for a considerable period of time after all symptoms of inflammation have subsided.

PROGNOSIS. J. F. W. Ross, Professor of Gynecology in the University of Toronto, advises the practitioner to terminate the pregnancy if the condition be a serious one. C. B. Reed claims that premature labor occurs in fifty per cent of the cases; forty per cent of the women going on to normal labor at term. Cragin believes that if the child has reached the viable age in utero and the evidences of pyelitis still persist with pain, temperature, and pyuria, interruption of the pregnancy is justifiable. The writer believes that termination of the pregnancy is seldom necessary.

REPORT OF PERSONAL CASES

CASE 1. Mrs. Miller; Case No. 163. Referred by Dr. A. F. Griffiths.

Patient aged nineteen; primipara; patient became pregnant in June, 1907, and has had no abdominal trouble until the present time; has had no vaginal discharge and no bladder irritability.

November 10, 1907, at about the end of the fifth month of pregnancy, the patient had a violent chill, was nauseated and vomited twice during the day; had sharp lancinating pain in the right side of the abdomen referred to the region of the right kidney or the gall-bladder; bowels had moved normally; pain extended and became more or less general in character. On the twelfth day after the inception of the trouble, a slight jaundice appeared; she suffered continually from severe headaches and intermittent pain in the right side; there was some rigidity of the muscles protecting the right renal region and the gall-bladder; deep pressure caused pain over this region, and there was also general abdominal tenderness; pus and epithelium were present in the urine; patient had an acute granular vaginitis, non-specific in character. Under medical treatment and rest in bed the patient rapidly improved; the temperature, which at first had been high became normal, and after ten days the patient was allowed to return home.

January 17, 1908, the patient had improved considerably in general health but her appetite had not returned; there was an increased amount of pus in the urine and there had been a moderate increase in frequency of micturition; there was some pain during the passage of urine.

January 18, 1908, a cystoscopic examination was made by the writer, and a catheter passed to the pelvis of the right kidney; the bladder mucous membrane showed little congestion, but the mouth of the right ureter was slightly congested; one ounce of residual urine was found in the pelvis of the right kidney; urine reaction was alkaline; specific gravity 1.020; gross appearance very cloudy, twice as cloudy as the urine collected from the bladder by catheter; slight trace of albumin. Microscopical examination of this urine showed it to be loaded with pus and granular renal epithelium. Bacteriological examination showed *a pure culture of colon bacillus.*

The pelvis of the kidney was washed with sterile salt solution and injected with two drams of a twenty per cent solution of argyrol.

Seven days later, a second cystoscopic examination was made which showed the lumen of the bladder markedly encroached upon by the enlarging uterus; the bladder was seen to be flattened from above downwards, that is, its long axis was antero-posterior, making the direction of the vesical portion of the ureter posterior and inferior; that is, instead of a gentle curve upwards along the posterior surface of the bladder, the first direction of the ureter was downward, so that with a direct cystoscope in order to catheterize the ureters the instrument had to be carried upward over the abdomen until it struck against the pubic arch.

This was the first case that suggested to me that very probably the obstruction to the flow of urine through the ureters took place, in some cases, in the vesical portion of the ureter or at the point where the ureter leaves the bladder wall, the ureter being either bent or flattened out at this point. As observed through

the cystoscope, the distortion of the wall of the bladder is very marked.

At this second examination, the left ureter opening was seen to be normal; the right ureter opening was slightly congested; a catheter was easily passed to the pelvis of the right kidney and a very small amount of residual urine was found. The specimen obtained in this way showed that the condition of this kidney was very markedly improved over that of the previous week, so that whereas the pus in the previous specimen had collected in large amounts at the bottom of the test-tube, in the specimen collected on that day there was so slight a suspension that there was simply a cloudy appearance to the urine; after ten minutes the urine which came from the kidney was less cloudy than the first urine, and after fifteen minutes an irregular rhythm in the dropping took place. The pelvis of the kidney was again injected with two drams of a 40 per cent solution of argyrol. After this treatment the patient was markedly improved, and although microscopically there were numerous leucocytes found in the urine, still there was no pus deposit on standing.

Three weeks later the patient was successfully delivered of a normal child, with no evidences of renal disturbance. She has made a complete recovery and at the present time is perfectly well.

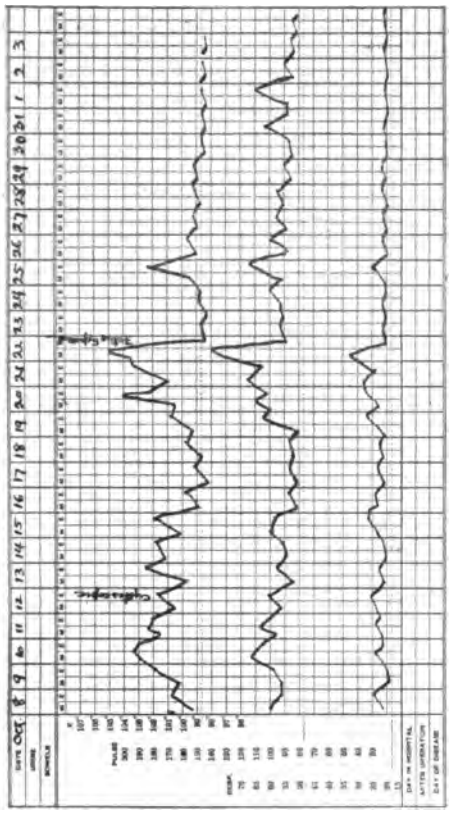
REMARKS. This case illustrates a number of conditions which have not previously been noted by other observers. In the first place, at the end of the fifth month of pregnancy the patient had an acute attack of pyelitis without previous renal disease; it was unilateral, being confined to the right kidney; under medical treatment the acuteness of the attack subsided, and she returned to her home where she had no further trouble for two months; all of this time, however, there continued to be present a subacute catarrhal inflammation of the pelvis of the kidney; as the uterus enlarged, pressure on the ureter increased, and she had a recurrence or an acute exacerbation of the inflammation. As a result of draining the residual urine during this second attack and then stimulating the mucous membrane of the pelvis with a 20 per cent solution of argyrol, the process was very materially checked and at the end of a week there was present simply a slight catarrhal inflammation without any other symptoms. At the end of seven days there was markedly less residual urine, and the pelvis was again stimulated and washed with argyrol with the result that there was hardly any pus remaining in the urine, and she proceeded without further trouble to make full term delivery three weeks later

The second point of interest is the fact that the urine taken directly from the pelvis of the kidney was alkaline in reaction, and later, when the process became less acute, it became neutral. In a discussion before another medical society it was stated that the acid reaction of the urine was pathognomonic of pyelitis, and my statement made at that time that frequently the urine was alkaline, has been proven by many subsequent exact observations. It is a fact, however, that in a case of pyuria where the urine is markedly alkaline, the inflammation is almost always most severe in the bladder, and where the pus is of renal origin, if due to pyelitis without much retention of urine, the reaction is usually acid. However, when we have a residual urine of any large amount in the pelvis of the kidney, the urine may easily be alkaline in reaction.

The third point of interest in this case was the appearance of distortion of the bladder due to the presence of the enlarging uterus; in no other case have I seen this so marked, for with a direct catheterizing cystoscope it was necessary for me to pass the catheters downward and backward in order to engage the first portion of the ureter, a condition analogous to that found in prolapse of the uterus with cystocele, with the exception that in this case the fundus of the uterus could be outlined within the bladder compressing it from above, downward, and encroaching greatly upon its lumen so that certain portions of the bladder appeared as mere slits. It is in such cases as this that two things are justifiable; either a termination of the pregnancy, or a renal lavage. Medical treatment and postural treatment fail to affect the condition except temporarily. If nothing be done to relieve the compression, a chronic pyelitis may result.

CASE 2. Mrs. Felsen, aged 28. Case No. 210. Referred by Dr. George MacNaughton.

Two-para; last period three months ago; some leucorrhœa for past five months; had one child three years ago, labor normal; no miscarriages; general health good. Patient has had considerable nausea and vomiting for the past three months; two weeks ago begun to have a slight bloody vaginal discharge; four days ago was seized with severe cramp-like pains in the lower part of the abdomen; had numerous slight chills; two days ago had a sudden sharp pain in the abdomen, and fainted; has had great difficulty in urination accompanied by pain and burning.



Case 2. Pyelitis of pregnancy. Patient aged 28. End of third month. Multipara. Aborted. Recovery

October 9, 1908, was admitted to the hospital; temperature 99.4° and pulse 100; desired to pass urine every five minutes; urine cloudy and foul; reaction acid; specific gravity 1.030; large quantity of pus present; leucocytes 11,000; polymorphonuclears 86 per cent. Medical treatment was instituted with elevation of the head of the bed but no improvement was noted during the next three days; temperature reached as high as 103.6°; persistent vomiting; pain was referred to the region of both kidneys.

October 12, 1908, cystoscopic examination showed marked general cystitis present; ureters catheterized showed urine containing a large number of pus cells coming from both kidneys.

Bacteriological examination showed in each case a bacillus with all the cultural characteristics of a *colon bacillus*. Pelvis of each kidney irrigated with 25 per cent solution of argyrol, and one dram left in the pelvis. Daily bladder irrigations and silver nitrate installations in the bladder were given, as well as a continuous Murphy proctoclysis. Urotropin administered in 15-grain doses, t. i. d. For a few days temperature ranged lower, but patient's general condition was decidedly worse and vomiting was occurring at intervals during the day.

October 19, 1908, patient's condition became so serious that it was decided to empty the uterus.

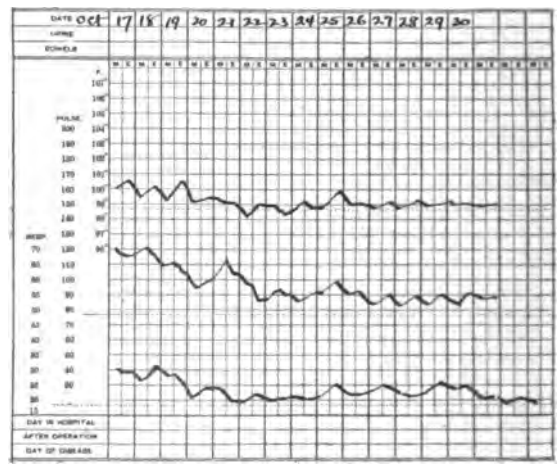
October 22, 1908, after the introduction of bougies, which were in place for two days, the temperature reached 105°, and shortly thereafter the fœtus was expelled. Following this the patient made an uninterrupted recovery, and was discharged from the hospital November 4, 1908, with no symptoms of infection referable to the kidney.

REMARKS. In this case we have a patient in the third month with a double pyelitis of pregnancy; the condition of the fœtus when it was expelled showed beginning degeneration of a greater degree than would be expected two days after insertion of bougies for abortion; neither the posture nor the irrigations with argyrol affected the case; it seems to me that in this particular case the cause was rather a septic infection of the kidneys than one due pressure of the developing uterus upon the ureters.

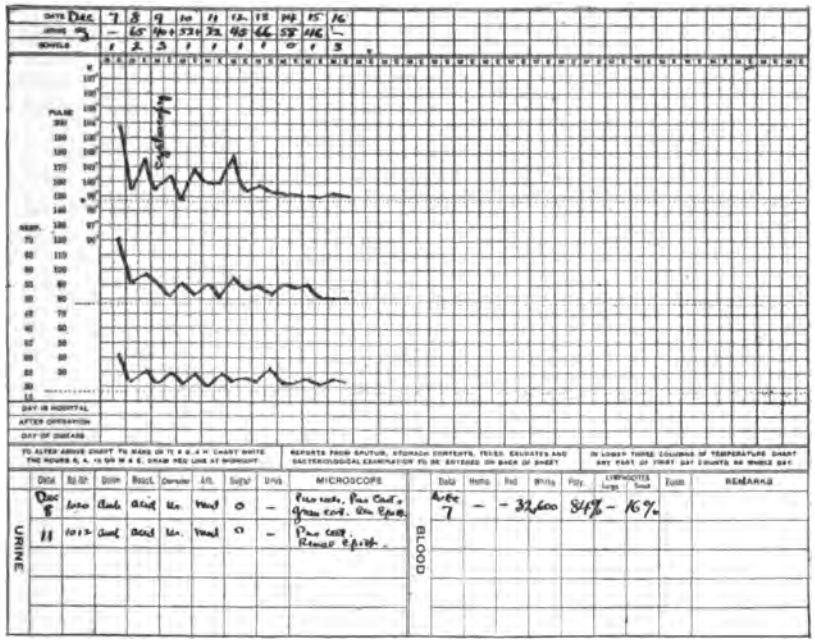
CASE 3. Mrs. Urdang, aged 26. Case No. 211. Referred by Dr. O. P. Humpstone.

Primipara; last period six-and-a-half months ago. Twelve days ago patient was awakened in the morning with a sharp, stabbing pain in the left lumbar region, which was relieved by hot applications; vomiting; bowels constipated; involuntary urination; urine loaded with pus; no casts. Temperature from 100.6° to 96.6°; leucocytes 10,000; polymorphonuclears 70 per cent; pain in the left lumbar region continued and she was admitted to the hospital.

October 20, 1908, cystoscopic examination; moderate degree of cystitis; left ureter opening slightly in-



Case 3. Pyelitis of pregnancy. Patient aged 26. 6½ months. Primipara. Renal lavage. Elevated trunk posture. Recovery.



Case 4. Pyelitis of pregnancy. Patient aged 19. Primipara. Full term. Renal lavage. Elevated trunk posture. Recovery.

flamed; urine collected from left kidney showed a few hyaline casts, epithelium from the pelvis of the kidney, many pus cells and polymorphonuclear leucocytes. In a single field, under the microscope, using 7-A objective and a No. 2 eye-piece, there were sixty pus cells in the field. Urine from right kidney showed a few leucocytes, and a number of red blood cells probably of traumatic origin, also a few hyaline casts; the pelvis of each kidney was washed with a 25 per cent solution of argyrol.

Bacteriological examination: *Urine from both kidneys sterile.*

Patient was put in the elevated head and trunk position, urotropin was given and the bladder was irrigated with 25 per cent solution of argyrol twice a week. Temperature remained practically normal.

October 27, 1908, a second examintion was made and the pelvis of the left kidney again irrigated with argyrol; urine from this kidney at second examination showed very few pus cells present, and all the signs of inflammation had subsided; next day patient was allowed out of bed.

November 4, 1908, patient was discharged from the hospital entirely cured.

REMARKS. This case presents the typical picture of an acute catarrhal pyelitis of pregnancy, probably due to pressure of the enlarging uterus; no infecting bacilli were found, but they were probably present. As in the first case, an examination of the urine after a week, taken from the diseased kidney, showed a very marked diminution in the absolute number of pus cells present.

CASE 4. Mrs. Diamond, aged 19. Patient at full term.

November 30, 1908, patient had a sudden, sharp pain in the right lumbar region, which did not radiate in any direction; high fever but no vomiting; bowels had been regular; no examination of the urine was made.

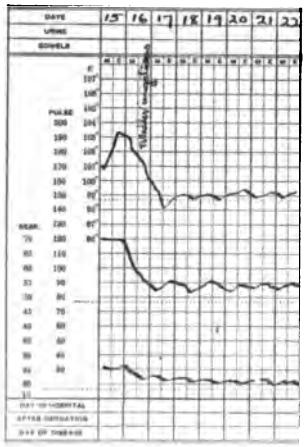
December 4, 1908, patient was delivered of a normal child.

December 6, 1908, had a chill, and later a high fever with great prostration and pain referred to the left lumbar region; no urinary symptoms; she was markedly prostrated and suffered considerably.

December 7, 1908, temperature 104°, pulse 120, respirations 40; urine was acid; specific gravity 1.020; contained pus casts and many pus cells, granular casts, and renal epithelium.

Blood examination: 32,000 leucocytes; 84 per cent polymorphonuclears. Temperature was septic in type.

December 9, 1908, cystoscopic examination revealed a general cystitis of the bladder; urine from left kidney showed pus cells and flocculi; right ureter not catheterized; pelvis of the kidney irrigated with argyrol. Patient placed in elevated head and trunk position; urotropin administered; bladder irrigated; for next three days temperature was slightly irregular, but on the fourth day it became normal; on the sixth day pa-



Case 5. Pyelitis of pregnancy. Patient aged 21. Six months. Elevated trunk posture. Recovery without renal lavage, but using bladder irrigation.

tient was allowed out of bed and made an uneventful recovery.

September 16, 1908, patient was discharged.

REMARKS. The case just detailed is an example of an acute pyelitis occurring at term; it is an example of a condition which may cause a severe septic state a few days after delivery, and in all cases of septic conditions following delivery a thorough examination of the urine may help to clear up the diagnosis.

CASE 5. Mrs. Silbert, aged 21.

Primipara in the sixth month of her pregnancy. Patient's condition was normal until five days ago when she was seized with a severe, sharp, stabbing pain over the right lower quadrant of the abdomen; this condition was increased at the beginning, during, and after urination, and the patient noticed that her urine was cloudy and high-colored; pain and rigidity over the right renal region; had frequent desire to urinate but it caused great pain; slight œdema of the feet; had severe chills in the morning and evening followed by fever and headache; now complains also of pain in the left lower quadrant of the abdomen; vomiting of stomach contents.

Patient was put to bed in the elevated head and trunk position; fluid diet; large amount of water. Bladder was irrigated twice during the day and argyrol injected. Catheterized urine from the bladder was alkaline; there was considerable albumin; loaded with pus; the day following admission to hospital temperature fell to normal, and pulse to 90. The urine was loaded with pus. Improvement was almost immediate, and at no time was the temperature again high; amount of pus in urine gradually decreased, and in thirteen days renal cells began to appear in the urine, but not in sufficient number to indicate any degeneration; the tenderness and rigidity in the renal regions gradually diminished and the patient was discharged at the end of three weeks entirely relieved. The bladder irrigations were given twice daily, using argyrol and silver nitrate, to clear up the cystitis.

REMARKS. In this case it was not deemed necessary to catheterize the ureters, inasmuch as the signs and symptoms were quite positive as to the origin of the pus, and the marked improvement in the patient's condition did not demand irrigation of the pelvis.

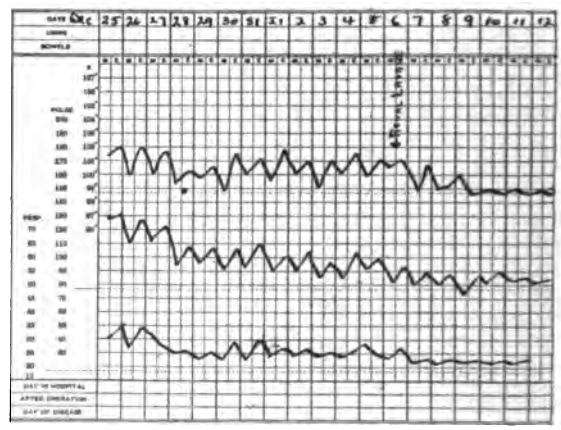
CASE 6. Mrs. Feinberg, aged 30.

Multipara. Patient in ninth month of her pregnancy; previous pregnancies normal.

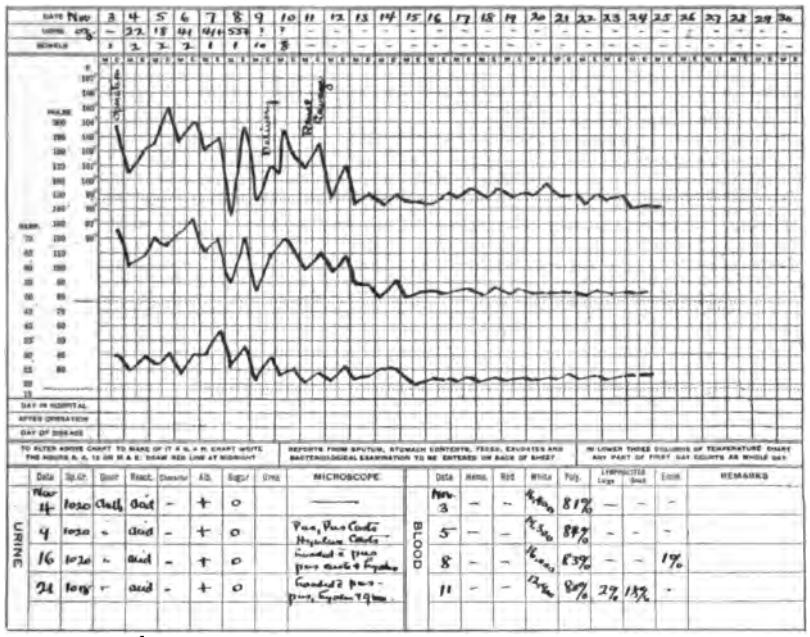
December 21, 1908, patient was seized with a sudden sharp chill and pain in the right side; had repeated chilly sensations followed by high fever; marked frequency of urination and pain upon urination.

Blood examination: Leucocytes 20,500; polymorphonuclears 90 per cent; urine acid; specific gravity 1.016; moderate amount of albumin; no sugar; loaded with pus cells and pus casts; few renal cells; no other evidences of nephritis. Temperature ranged from 99° to 102° every day; pulse from 125 to 90.

January 6, 1909, cystoscopic examination; bladder showed a moderate cystitis; ureters catherized; right kidney pelvis contained four and one-half ounces of residual urine and pus; the first test-tube contained only a small amount of pus, the second test-tube a little more, the third test-tube still more, and the fourth test-tube contained urine loaded with pus; urine from the left kidney was normal in every way. On account of the large amount of residual urine in the pelvis of the right kidney, the catheter was left in place after injecting the pelvis with 25 per cent solution of argyrol; the catheter remained in the ureter for five hours, and at the end of that time the pelvis of the kidney was again



Case 6. Pyelitis of pregnancy. Patient aged 30. Ninth month. Multipara. Renal lavage. Elevated trunk posture. Permanent catheter in ureter for five hours. Recovery.



Case 7. Pyelitis of pregnancy. Patient aged 20. Primipara. Seven months. Complicated by catarrhal appendicitis. Operation. Renal lavage. Elevated trunk posture. Recovery.

irrigated with 25 per cent argyrol solution. Patient was turned on the left side, was postured with head and trunk raised, pelvis lowered, urotropin given, and daily irrigations of the bladder introduced. The following day the temperature became normal and remained so.

Bacterial examination revealed a *gram positive and gram negative bacillus and diplococcus*, varying in size, spore-bearing and fermenting sugar. Patient made an uneventful recovery and left the hospital before the birth of her child.

REMARKS. The patient was treated expectantly for two weeks with the hope that she would not need to have her kidney irrigated; her course is shown in the accompanying temperature chart, as well as the rapid improvement after the renal lavage. It is the first case in which I have found such a large amount of residual urine in the pelvis of the kidney; it is also the first case in which, so far as I know, a permanent catheter has been left for so long a time; when removed, the catheter, which had become molded to correspond to the curves of the ureter, showed the direction of the ureter to have been changed so that it was pushed over further to the right, the extra curve being midway between the pelvic brim and the kidney.

CASE 7. Mrs. Herman, aged 20. Referred by Drs. Duffield and Humpstone.

November 3, 1908, patient was admitted to the hospital; temperature 103.6°, pulse 125; a history of sudden, sharp pain in the right and left inguinal region accompanied by chills and fever; painful urination; she had suffered from slight attacks of pain in this region for the last five years; at present she is in the seventh month of pregnancy; gives a history of slight bleeding from the uterus two months ago.

Urine examination did not reveal the presence of any pus cells; leucocytes 20,000; polymorphonuclear leucocytes 84 per cent. An operation was done by Dr. Duffield and an acutely congested appendix removed, the seat of an acute catarrhal inflammation; during the next five days the patient had a stormy course, temperature ranging from 100° to 105°, patient showing marked symptoms of general sepsis; at this time patient was referred to department of cystoscopy.

Blood examination showed 15,000 leucocytes with 80 per cent polymorphon clear cells.

Urine examination showed acid urine containing many pus cells, a few pus casts and hyaline casts; on that day she aborted, being delivered of a seven months' fœtus that died in twelve hours.

Cystoscopic examination was made and the bladder was found to be the seat of a general cystitis; ureters were catheterized and pus was found in the urine from both kidneys; the pelvis of each kidney was irrigated with 25 per cent solution of argyrol; her temperature became normal on the fourth day after delivery, and she made an uneventful recovery.

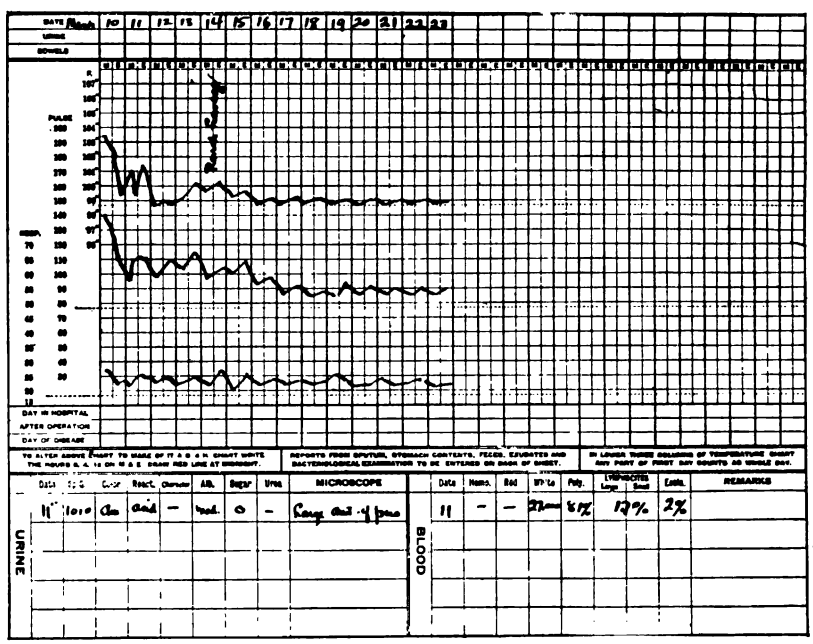
REMARKS. In this case we have a condition of double pyelitis of pregnancy, complicated by an acute catarrhal inflammation of the appendix; it is probably a fact that the original condition was a pyelitis, and if that had been controlled it might not have been necessary to have done the appendectomy and the child might have been saved. At the time of the first examination of the urine no pus was found, and it is probable that at that time the ureter was occluded and no secretion was being expelled from the right side. I believe it is occasionally the case that a diagnosis of appendicitis is made where pyelitis is the real cause of the trouble; in this case there was no question about the existence of an acutely inflamed appendix, but at the same time, the condition of the appendix was not such as to account for the severity of the septic condition.

CASE 8. Mrs. Wilder, aged 26. Case No. 244. Referred by Dr. Leon Louria.

Primipara; at seven months. Eight days ago patient was suddenly taken with a severe chill followed by fever; vomiting; severe pain in the back, more especially on the left side; chills and fever with pain in the left side occurring every night until admission to the hospital; during the day the patient was more comfortable but had no appetite; had to urinate every few minutes in small amounts; some vomiting and suffering from severe headaches.

Examination showed rigidity of the muscles protecting the left kidney; pain referred to left kidney and down over bladder; urine acid; moderate amount of albumin; large amount of pus. It was hoped that a cystoscopic examination would not be necessary. Patient was placed in the elevated head and trunk position, and was given urotropin and bladder irrigations, but the irregular temperature still persisted and she did not improve, so after a few days a cystoscopic examination was done; the bladder was found to be the seat of a general cystitis with slight congestion of the left ureter opening, the urine collected from the left kidney showed a moderate amount of pus; that from the right kidney was normal; slight retention of urine in the pelvis of each kidney, but there was no pus in the right side; each pelvis was irrigated with 25 per cent argyrol solution. Her temperature remained normal and at the end of a week another cystoscopic examination was made, but the conditions of the ureters did not warrant a further irrigation of the pelvis.

REMARKS. At the time of the present report the patient has entirely recovered from her symptoms and her temperature has been normal for nearly two weeks; the bladder irrigations have been continued, and there is still some pus in the urine, but not more than



Case 8. Pyelitis of pregnancy. Patient aged 26. Primipara. Seven months. Renal lavage. Elevated trunk posture. Recovery.

would be accounted for by the amount of cystitis present; otherwise, the patient is entirely well.

CONCLUSIONS

In summing up there are a number of points that I would like to emphasize. Other observers have already laid down rules for diet and the use of urinary antiseptics which are proper to adopt in these cases. Many observers have taught that it was best for the patient frequently to assume the knee-chest posture in order to throw the uterus away from the ureters and relieve the pressure in this way; if my observations are correct, that the pressure of the bladder is more frequently the cause of the obstruction, then this position if assumed would increase the pressure upon the viscus. During the course of cystoscopic examinations I have often observed that when the patient was in the recumbent position the droppings from the ureteral catheter came very slowly, but as soon as the patient was raised up, and especially if she assumed the sitting posture, the droppings increased fifteen to twenty times the number that were previously noted. In one case, particularly, I was able to collect only about two cc. in ten minutes from a diseased kidney, but when I allowed the patient to assume the sitting posture the urine collected at the rate of four cc. a minute. My conclusion from this observation was that there was more to be gained from favoring drainage of the renal pelvis by a position in which the kidney was on a higher level than the bladder, than there was from any fancied relief of pressure on the ureters. Our results and those of a few others who have adopted this method have been very satisfactory.

In a given case it is perfectly safe, should the symptoms not be too severe, to wait for eight or ten days without attempting to catheterize the ureters; if at the end of this time there be a persistent temperature with pain and pyuria, or even without pain, it is indicated to pass a catheter to the pelvis of the affected kidney to drain it thoroughly, and then to instill one dram of 25 per cent argyrol solution. If the same case be examined a week later, the absolute number of pus cells will be very remarkably diminished, showing, beyond question, the effect of this treatment. In a case where there is a large amount of retention in the pelvis of the kidney, with considerable pus present, it is indicated to leave the ureteral catheter in place after washing the pelvis of the kidney, for four or five hours or even longer, repeatedly washing the pelvis of the kidney with some antiseptic lotion.

Abortion, or premature labor, is seldom necessary in this class of cases, but where there is a bilateral involvement with persistent pain and pyuria that does not decrease, and a continuous fever, after trying prescribed methods of treatment, termination of the pregnancy in the interests of the mother is justifiable. This is especially true of cases of infectious origin.

In my own experience I have proven beyond question that in some cases the reaction of the urine in the pelvis of the kidney, in cases of pyelitis, may be alkaline; I believe this depends upon the amount of the retention in the pelvis.

There are many cases of undiscovered kidney disease that are exaggerated during pregnancy, the demands of which would involve operative interference on the kidney before recovery could be hoped for.

It is not necessary to again go over the points which I have tried to bring out in the discussion of each case; I have reported simply my own personal experience, and my deductions are based on complete cystoscopic examinations and careful observations made in a well-equipped hospital.

DEPARTMENT OF TECHNIQUE

THE HARRIS DRESSING FOR FRACTURE OF THE CLAVICLE

By WILLIAM HESSERT, M. D., Chicago, Illinois
Professor of Surgery, Chicago Policlinic; Surgeon to Alexian Brothers and St. Joseph's Hospitals, Chicago

The indications involved in the treatment of fracture of the middle third of the clavicle have been clearly understood since the time of Hippocrates, but it has been found very difficult to embody them in practice, as attested by the seventy different methods mentioned by Gurlt. The dressing varied from a simple sling, to the most complicated appliance. It was usually the case, that the better the coaptation of the fragments, the more intolerable was the dressing to the patient. In fractures of the middle third of the clavicle the inner fragment is drawn upward by the sternomastoid muscle. The rest of the shoulder girdle, namely, the outer fragment with the shoulder and scapula, of their own weight, and by muscular traction, are drawn downward, inward, and forward (Fig. 1).

The vertebral border of the scapula is no longer parallel to the spine, but forms an angle with the sagittal line. On the other hand, the axillary border becomes more nearly sagittal, while the inferior angle is downward, outward, and forward of its normal position. Reduction is to be sought by carrying the shoulder upward, outward, and backward, and any dressing that will retain it in that position with comfort to the patient can be termed efficient. The dressings of Sayre, Velpeau, Desault, and others, while efficient in some cases, are often intolerable.

Dr. M. L. Harris, in September, 1896, published in the *Chicago Medical Recorder*, "A New Dressing for Fracture of the Clavicle." This excellent dressing fulfilled the indications with comfort to the patient and Harris pointed out the importance of restoring the scapula to its normal position. This dressing has not received the recognition in the current text-books that it justly deserves. The writer has used the dressing, with slight modifications, for over five years on many cases with

Fig. 1. Fracture of the left clavicle, showing the characteristic attitude of the patient, and the dropping downward, forward, and inward of the shoulder.

Fig. 2. The adhesive plaster band is applied, showing the lapel under the right armpit.

Fig. 3. The four-tailed bandage has been placed around the arm, the tails have been crossed, and traction is being made to ascertain how much pull is necessary to bring the fragments in position, before pinning the tails to the lapel.

excellent results and has found it both efficient and comfortable to wear. The dressing about to be described, while differing in some detail, is practically as described by Dr. Harris in his original paper. While Dr. Harris first used a muslin bandage around the chest, he suggested that a wide strip of adhesive plaster was preferable. As applied to a fracture of the middle of the left clavicle, as in the case illustrated, one proceeds as follows:

Procure a piece of zinc oxide adhesive plaster six or seven inches wide and long enough to reach about two-thirds around the chest. One end is folded over with the adhesive surfaces opposed, to form a sort of lapel. For a fracture of the left clavicle, apply the plaster to the chest (shave if necessary) so as to have the lapel in the right axillary region (Fig. 2). The plaster strip can be adjusted to bring the lapel over the right breast if desired.

The upper edge of plaster should be as high as possible without impinging too much on the axillary folds. This band, besides forming a fixed point to which to fasten the arm dressing, in a measure helps to bring and hold the scapula in its normal position. Then a piece of heavy muslin or light canvas is provided and cut wide enough to reach from the axillary fold to the bend of the elbow without its edge cutting into either. The muslin

Fig. 4. Fig. 5. Fig. 6.

Fig. 4. The four-tailed bandage has been fastened in place; it is pulling the shoulder backward, outward, and upward, and the scapula is being held in its proper place.

Fig. 5. Front view of Fig. 4. By comparing with Fig. 1 it shows the restoration of the shoulder.

Fig. 6. A muslin bandage has been passed around the chest and arm, by which additional leverage is brought to bear on the shoulder, while tending to force back and hold the scapula in place. Dressing is complete.

can be doubled if necessary. Take a two-yard piece and fold it in the middle. Then take the free ends and tear the material down the center to within a few inches of the folded border.

This makes a four-tailed bandage of the required width folded in the middle. The arm is passed through the fold, so that the untorn portion comes opposite the outer surface of the humerus. All four tails pass behind and around the body in the same direction. By drawing on these the arm is carried backwards and inwards, the scapula upward and inward toward the vertebral column, while the tips of the shoulder, and consequently the outer fragment of the clavicle, are carried upward, outward, and backward into place (Fig. 3). The extent to which the arm should be drawn backward and inward depends entirely on the amount of displacement and deformity to be overcome. The object of tearing the piece into four tails is now readily seen. When the arm is drawn backward in this manner the anterior and outer surfaces are obliquely placed so that were the bandage in one piece when drawn taut it would be making pressure at its upper edge, while its lower edge would be very loose. In passing the four tails around the body they cross so that the two upper become the lower and the two lower the upper. In this way the entire width of the bandage is tight, so that the pressure is uniformly distributed throughout the whole length of the arm. The pressure coming almost entirely on the outer side of the arm, no matter how firmly it is drawn it cannot materially interfere with the circulation." The four tails are continued around the back and pinned to the lapel before mentioned (Fig. 4).

This is usually sufficient to bring the fragments in good position. However, it may be deemed advisable to apply a broad roller bandage around the lower portion of arm and chest (Fig. 6). This exerts still greater outward leverage on the shoulder, and also tends to hold the scapula in proper position. There is no axillary pad necessary. The elbow joint and forearm are free and the latter is supported in a sling. This is a great comfort to the patient, as the elbow can be moved at will without in any way involving the shoulder.

The dressing should be inspected every two or three days, so that if loosened or in any way disarranged it can be readjusted. The seat of the fracture being always accessible to sight and touch, the continued efficiency of the dressing can at all times be controlled. The importance of maintaining a proper reduction of the fragments for the first ten days cannot be too strongly emphasized, as the clavicle unites very quickly and any deformity still present after two weeks can be reduced only with the greatest difficulty. The dressing has been found applicable to both children and adults. In the former it is worn about three weeks, and four in the case of the latter.

A NEW METHOD OF PERFORMING OPERATIONS ON THE SKULL[1]

By WILLIAM HENRY HUDSON, M.D., Atlanta, Georgia

Any new instrument designed for opening the skull must combine simplicity, accuracy, and safety, and these three factors are all secure in the new instruments which I have devised. Although I have demonstrated these before various societies, I find that the principles of their manufacture have been misunderstood and I therefore thought it best to publish in detail the principles of their application. They are built on an entirely new mechanical principle which I have applied to another principle which is very old.

Their peculiarity being that they will cut as long as they need to, but will cease cutting, and cannot be further rotated, when the layer of bone in front of them becomes so thin as to give way before their advance. In other words, as long as there is resistance in the bottom of the opening they will cut; when this resistance ceases, they will not move further. Large drills, trephines, and burrs, have been made upon this principle; but everything has been discarded except burr-like tools.

In making openings into the skull a spiral perforator with a sharp point is first used. This stops cutting just as a fine pin-head-size projection is made on the inside of the skull. Should this be over the groove containing the middle meningeal, the artery would not be injured. The hole is then completed with a spiral burr with a dull center. Both burrs go in under their own pressure; stopping automatically just as the thinnest film of bone is pushed ahead of them. There are

[1] Dr. Keen, in an addendum to Frazier's article, Keen's Surgery, Vol. v, has written a short account of the instruments here described.

two other round burrs for enlarging the holes and for cutting away the external plate as described hereafter and shown in the illustrations.

The forceps, at first sight, suggest the Dahlgren, but are made on an entirely different principle; and are at least many times more efficient than that very useful instrument. The Dahlgren is nothing more than a punch worked by a lever; the forceps here described is a reversed shear, the lower blade transcribing the arc of a large circle, the upper blade transcribing the arc of a smaller circle. Furthermore, should the bone be so thick and hard, though I have never found such a case, that the pieces are not bitten out readily by compressing the handles, the handles may be lifted, thus making the entire length of the forcep an extra leverage.

The holes in the skull can be readily made in ten seconds each, and the channels between them cut with the forceps in about as short a period of time, making it possible to turn down a large osteoplastic flap without any strain or uncertainty, in certainly five minutes, or even less time. I have repeatedly done the bone work where there were six holes made, and the channels completed between them, and the bone flap lifted, in less time than this.

In making an osteoplastic flap with the tools here described, as many holes may be made as is deemed expedient, I generally making six; two at the free border of the flap, being always made at a fixed distance apart, about an inch and a quarter from center to center, so that a Gigli wire saw carrier of fixed curve may be inserted from one hole into the other without impinging upon the brain any further than the thickness of the carrier. This short space is cut out on a broad bevel for the flap to rest upon when replaced. This, I consider very essential in making an osteoplastic flap. The other holes are united with the forceps.

After an immense amount of experimentation I find that this method is far superior in safety and speed, in ease of execution, and certainty, to any power-driven engines, either electrical or hand, besides, having the advantage of great simplicity of construction, and in sterilization. The burrs are driven by a hand brace, with an improved lock which has for use upon the cerebellum an extra joint, which I have termed the *cerebellar attachment*. This lifts the brace away from the head to that extent that the bow of the brace does not strike the shoulder of the patient. There is one condition which must be borne in mind, which I have found once in practice, and that in the case of a negro, the posterior portion of whose skull was more than half an inch thick with a very soft, spongy

Fig. 1. Spiral perforator. To be used first. It makes an opening barely through skull, which is to be finished by the follower, No. 2.

Fig. 2. Dull pointed burr, which I have designated a "follower," for completing opening made by spiral perforator.

Fig. 3. Burr with large dull center for enlarging any opening for permanent removal of bone, as in decompressions.

There is another round burr smaller than this, with a small dull center, for cutting away external plate of skull as shown in Fig. 5.

diploe. In this case the spiral perforator and the follower stopped in the external plate naturally. In such a case the external plate must be cut away with the smaller of the round burrs, the operation to be completed on the inner plate just as if it were the entire thickness of the skull.

It might be well, as suggested by Dr. Keen, to make the openings in the region of the middle meningeal, last, so that if this artery should be injured, the bone-flap could be quickly lifted and the bleeding stopped; but with the instruments here described, this injury would not take place unless the artery were in a closed canal; and in this condition as the spiral perforater does not make a complete hole, the bone wax would easily stop the bleeding. If six holes are to be made, outlining the osteoplastic flap, they should all be made without changing the spiral perforator. These holes, remember, are not completed, only a pin-head-size projection on the inside of the skull.

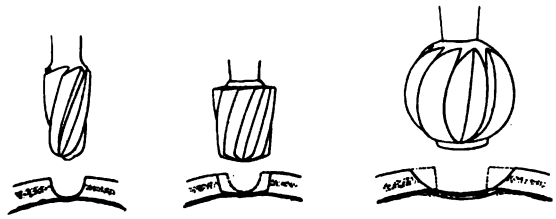


Fig. 4. Showing usual use of spiral perforator and spiral follower to complete the opening; also the use of the large round burr with large dull center should larger opening be needed.

Fig. 6. Showing inside of skull after spiral perforator has stopped, and the opening looking down into it. The completed hole shows thin film of bone at its bottom.

Should these holes bleed a little wax is pushed into them with the finger tip, the spiral perforator changed for the spiral follower, the follower taking up the wax, if any has been used, and the bone shavings, forcing this mass into any bleeding points in the wall of the opening, very effectually stopping all hæmorrhage. In beginning each hole the follower, if the wax has been used, should be cleaned with a piece of gauze, so that the lateral blades will not be interfered with by the deposit of wax and bone shavings between them. It will be noted that these instruments cut better than any instruments heretofore made.

Any one who proposes using these instruments should try them out on the shoulder blade of a two year old ox, leaving the periosteum on the front side to represent the dura; in this bone will be found the thin solid bone, thick bone with soft, spongy center, indeed, all the conditions which may be found in the skull.

All of the tools are self-feeding and do not require pressure, to any great extent, upon the brace. The proper method of making the hole is to apply the instrument to the skull, turn the brace until there is a distinct sensation of stopping; then the perforation is complete unless the diploe is thick and very spongy.

The boring tools. These are superior to others in the following particulars:

They are self-feeding, cutting much faster than any other, whether driven by hand or electricity; stop automatically when through the bone, pushing a thin film of bone ahead of them so the dura is not injured. Without the use of bone wax, or with it, if needed, the wax and bone shavings are forced into the walls of the holes and prevent hæmorrhage from the bone. Any number of holes may be made, as only a few seconds are required to make each hole. Should such a necessity arise the bone work could be done in the dark.

The forceps. The forceps are simple in construction, cheap, and can be entirely sterilized by heat. They shear out distinct bites of bone, and work very rapidly; do not slip whether bone is thick or thin; the entire handle may be used as leverage, if needed; cuts faster and safer than the only other good means, the spiral osteotome.[1] Tends to control bleeding from bone by pressing internal and external plates of bone together. Is not a punch, as is the Dahlgren, but a reversed shear, the points of the upper and lower blades striking into the bone first. The cutting face of the lower blade is wider than the shank so that it can be moved freely in the channel. As the number of holes is not limited, being made so quickly,

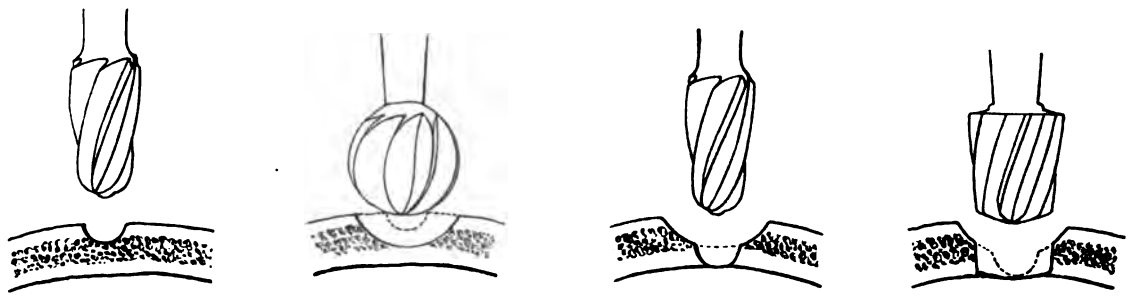


Fig. 5. Shows thick diploe where perforator and follower stop in external plate of skull. The smaller round burr cuts away the external plate and operation is continued on internal plate as if it were only one thickness.

[1] Dr. Chas. H. Frazier uses the spiral osteotome with great skill, and obtains most satisfactory results. He considers the spiral osteotome, however, not an instrument for the untrained. Perhaps the untrained should not use any kind of instrument. I have used the spiral osteotome in twenty brain cases, but have permanently discarded it.

the shank is made wide enough not to break, and the bites are much longer than possible otherwise.

Primarily, all the instruments are hand-driven, a quality absolutely necessary in a surgical instrument. A surgical instrument must be an addition to the surgeon's hand, an extension of it, partaking of his sense of touch and his trained reflexes. This fundamental principle displaces, in my opinion, all power-driven tools, when hand-tools have been perfected.

These instruments require absolute accuracy in their production; and one should be very careful that they are properly made. Should the twist of the lateral blades be too little, or too much, or should the taper of the instruments, or their relative sizes vary, they will fail of their purpose.

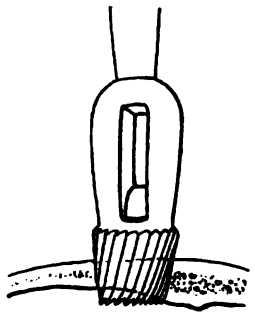


Fig. 7. Showing danger in using even a small trephine where bone changes from thick to thin in a short space.

Recently an acquaintance of mine who understands these instruments informed me that at the recent meeting of the Pennsylvania Medical Association, at Philadelphia, three makes of these instruments were offered for sale, none of which were properly made, and none of which were even safe for the patient.

I therefore have ordered all manufacturers to send each set to me for my personal inspection. with wire for sealing and card for my signature, otherwise I cannot guarantee their quality or accuracy.

The instruments fulfill all needs in every operation on the skull; all shapes of osteoplastic flaps. including the cerebellum; all conditions where the bone is permanently removed, as in decompressions; all simple openings, explorations for hæmorrhage and abscess; brain punctures for drainage of the ventricles; for drainage in basilar fractures and injuries of the brain; for foreign bodies and fractures; for all operations on the intracranial nerves.

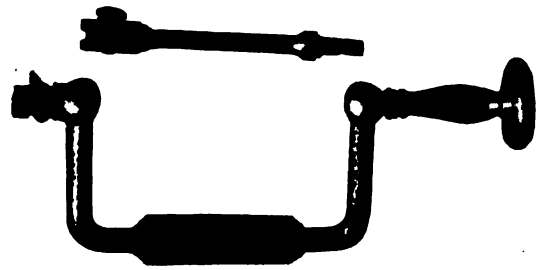


Fig. 8. Hand brace and cerebellar attachment. Hand brace with a larger bow to give smoothness in turning. Cerebellar attachment to lift brace away from shoulder of patient in operations on the cerebellum. The brace, cerebellar attachment, and boring tools have a perfected lock.

Some recent experience has proven the great aid these instruments give in chest operations. As in section of sternum crosswise and lengthwise; section of ribs, especially where large chest flaps are needed. This work will be reported fully later in this journal.

Instead of cutting out large areas of bone with the ordinary forceps, it is better to make the requisite number of small holes, outlining the bone to be removed, and to unite them with the channel cutting forceps.

I wish to emphasize the following: These are the only boring instruments that will cut an infant's skull, all others pushing the skull forwards to a dangerous degree.

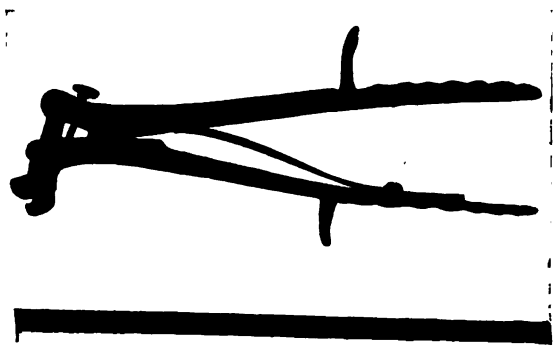


Fig. 9. Forceps of new type. Action that of reversed shear. Does not slip or break, and cuts out a channel $\frac{3}{16}$ inch wide, at about 8 to 10 "bites" to the inch. Entire outlines of the osteoplastic flap can be cut out in from one to two minutes with absolute ease and certainty. The forceps has long leverage and handles, and may be lifted if needed, the rounded front margin of upper blade acting as a fulcrum. Forceps 10½ inches long.

FIGURE-8 PURSE STRING IN APPENDECTOMY

By FRANK B. WALKER, M. D., Detroit, Michigan

The circular purse string around the stump has been a part of my usual technique for appendectomy since December, 1896. None of my cases have exhibited post-operative hæmorrhage. I have been careful, however, to tie every bleeding point.

When Dr. Wyeth, at Atlantic City, in June, 1907, criticised this method and urged the primitive and crude one of ligation without inversion, I could hardly believe his serious intent, and not until I had known others to have attributed fatalities to the purse string did I consider it inadequate.

Last August, while doing this operation, an unusually troublesome bleeder in the wall of the stump adjacent to the mesentery suggested to me the modification of the circular purse string into a figure-8, as is illustrated in the accompanying drawing. The modified form was used in that case and has since been employed in others with entire satisfaction.

The object of the second loop of the purse string primarily was to ligate the vessel in the wall, which according to Hessert[1] is present in about five per cent of the cases, but it can also be made to roll in the mesentery and thereby cover the triangular space which is otherwise uncovered by peritoneum.

Before inserting it, the appendical artery in the outer portion of the mesoappendix is tied off as usual. Then the suture — catgut — is introduced beginning at the base of the appendix on the side opposite the mesentery, and, passing well under the artery, made to encircle it, grasping the mesoappendix in its course, and finally emerging near the point of beginning. The stump is inverted after the manner of J. E. Cannaday,[2] by grasping part of it with an artery forceps passed underneath an exposed part of the suture, and depressing it by raising the handles of the forceps, after which the purse string is tied as usual, the forceps being loosened and carefully withdrawn. In the act the cæcal opening is closed, all possible hæmorrhage effectually controlled, and the triangular space covered by the inversion of the mesoappendix.

I, ileum; C, cæcum; A, appendix removed; AS, stump of appendix; F, artery forceps; 1, appendical artery; 2, supernumerary vessels present in one in twenty cases.

The drawing represents that stage of the operation when the appendical artery (1) has been tied off, the appendix (A) in the grasp of strong forceps divided, the figure-8 purse string inserted, encircling mural vessel (2) and including mesoappendix, and the forceps (F) in position to invert the stump of the appendix (AS).

[1] Journal American Medical Association, vol. xlvii, p. 2010.
[2] Journal American Medical Association, vol. xlviii p. 1865.

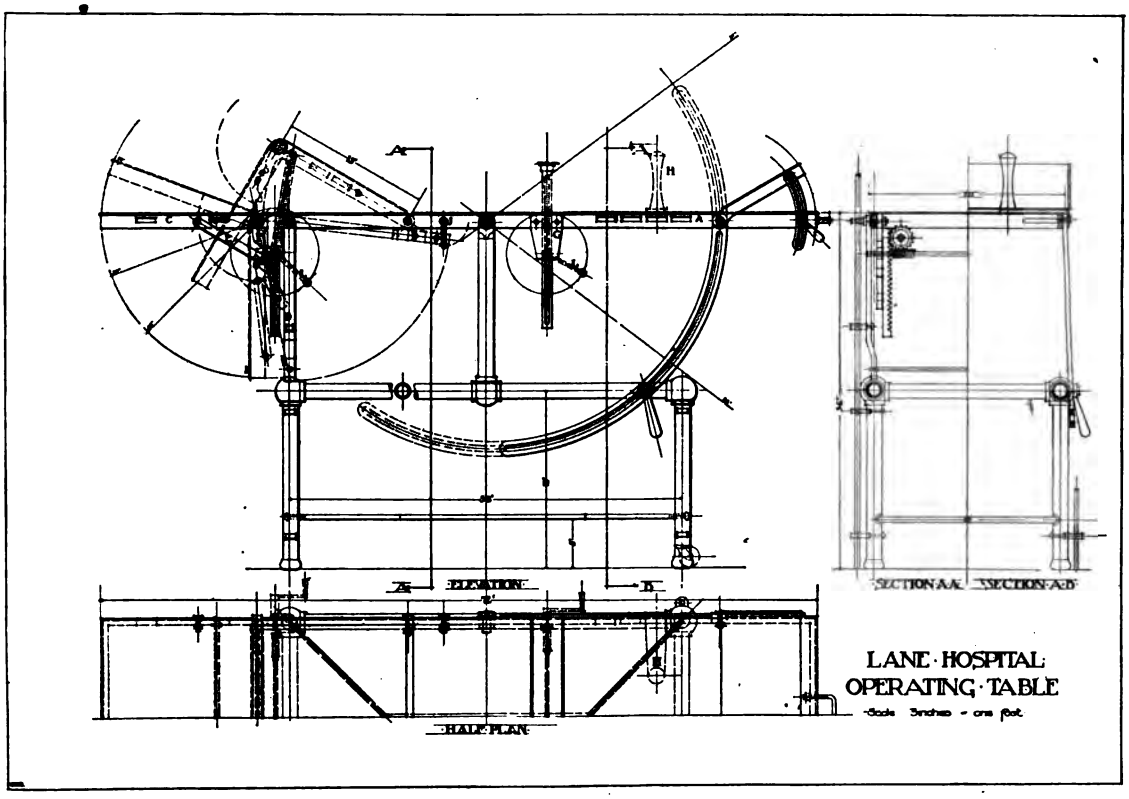
FLEXION OF THE PELVIS IN THE TRENDELENBURG POSITION

By EMMET RIXFORD, M.D., San Francisco, California

Flexion of the pelvis is a most valuable addition to the conventional Trendelenburg position in pelvic surgery. When the average adult person lies on a flat table on his back the pelvis is drawn into the position of extension, causing elevation of the lumbar spine and putting the anterior abdominal wall on the stretch, thereby lessening the capacity of the abdomen and causing a corresponding increase in intra-abdominal pressure. In women especially, with the large hips and small waist, the lordosis is marked. In fat persons this increase in intra-abdominal pressure interferes to a marked degree with the respiration, increasing the work of the diaphragm and oppressing the heart. Many fat persons require the head and shoulders to be raised, as on several pillows, in order to sleep, which arrangement is little more than a means of flexing the lumbar spine.

In the Trendelenburg position with flexion of the knees all these disturbances are intensified; the large buttocks and tapering thighs of the fat person cause an exaggeration of the degree of extension of the pelvis with consequent traction on the rectus muscles; the diaphragm soon tires with the increased labor it is called upon to perform and the abdominal muscles are called into play to aid respiration by producing forced expiration, and thus is brought about the lungeing respiration of fat persons in this position. The increased intra-abdominal pressure is a source of great annoyance to the surgeon because of the greater tendency to prolapsus of the intestines requiring greater quantities of pads and greater force to hold them back, all of which is to the serious disadvantage of the patient.

The difficulties are further increased by greater development of the musculature and are a maximum in heavily muscled fat men. Searching in the belly of such a one for a gunshot or stab wound of the intestines when there has been no



chance to evacuate the bowels, presents difficulties which are well nigh insurmountable short of evisceration — and this is perilous. It is astonishing how much relief is obtained in such cases by flexion of the pelvis to 20° or 30°.

For the last three years the writer has used a table which conveniently provides for flexion of the pelvis when the patient is in the dorsal position or in the Trendelenburg position, and finds the relief given by a few degrees of flexion of the pelvis most comfortable; the anterior abdominal wall is relaxed; the abdominal muscles no longer engage in forced expiration; there is less difficulty in the use of retractors; the intestines have little tendency to prolapse, therefore interfering little with the field of operation, all of which greatly facilitates the general conduct of the operation, makes a very distinct saving of time during which the patient is under the anæsthetic, and very definitely lessens the trauma of the intestines. The respiration is more quiet, causing far less fatigue to the patient. Dr. Caroline Palmer, anæsthetist to Lane Hospital, finds the giving of an anæsthetic to a patient with pelvis flexed a much less anxious procedure than where the ordinary Trendelenburg position is used, especially if the patient be fat.

In these four years' use of the table the writer has noted a singular freedom from backache on the part of the patients after operation. It would seem that what the lumbar spine wants in order not to be set aching after a prolonged operation is not more support, as some have averred, but more relaxation such as is given by flexion of the pelvis. He has therefore grown accustomed to raise the knees slightly in most operations where the patient is required to lie on his back for any considerable length of time.

Of course there is a practical limit beyond which it is not expedient to flex the pelvis in the Trendelenburg position (25° or 30°) because, with greater flexion, work in the depth of the pelvis and especially on the anterior wall must then be performed at an awkward angle — to some extent up-side-down.

Some surgeons have endeavored to overcome the disadvantages of the conventional Trendelenburg position by keeping the legs extended when the table is tilted, holding the patient from sliding by means of shoulder rests. This corrects only a small part of the trouble and has the positive disadvantage of increasing the height of the arterial blood column above the heart, giving that organ more work to do.

Inasmuch as the object of the Trendelenburg position is to facilitate pelvic operations by taking advantage of gravity in keeping the intestines out of the field of operation, much of the benefit of the position is negatived by the interference with the respiration and heart action as described above. With the pelvis flexed to a suitable angle the field of operation can be kept clear of intestines with a considerably less degree of tilting of the table as a whole, which has the advantage of still further lessening the height of the arterial blood column above the heart.

The operating table mentioned and herewith illustrated in improved form is designed to furnish the surgeon a table which, while strong and rigid, is capable of a number of adjustments commonly found of convenience in general operative work. It may be looked upon as a development from the Baldwin table, which is deservedly one of the most popular designs of operating tables in use in American hospitals.

Its distinguishing features are the following:

1. It may be tipped with head up or down to an angle of about 35° by the anæsthetizer in a moment.

2. The thigh and leg portions (B and C) of the table are fitted on an inner frame (B) which may be tilted independently by a worm gear and ratchet so that the pelvis may be flexed through an angle up to 30°, when the patient is in the dorsal position or in the Trendelenburg position.

3. When the patient is in the lithotomy position the leg section (C) or apron as it is sometimes called, is flexed to a right angle or even more (102°), thereby being placed well out of the way of the operator's knees.

4. When a particularly rigid table is desired, as in much orthopedic work, two swinging legs (D) may be dropped into a vertical position into sockets as shown and the table clamped down by means of the arc and friction clamps. When not in use the legs are simply swung up by rings (J).

5. The rack (F) is strong and is a continuation of the inner frame (B) and the brace (E) which engages in it permits the leg section (C) to be tilted to various angles as shown on the drawing.

6. The shoulder rest is of simple construction and is put into place by simply pushing its under strap into one or other of the sockets shown in the main frame, according to the stature of the patient. When the table is tilted elevating the patient's head, the shoulder rests may be used in the axillæ to prevent the patient from sliding down in the opposite direction, or, to avoid the danger of compression of the axillary nerves in prolonged operations, the shoulder rests may be placed in suitable slots in the leg section of the table or apron and a piece of board laid across them for a foot rest.

7. For operative work on the front of the neck (goiter, epithelioma, tuberculous glands, etc.) the head of the patient may be placed on the so-called leg section (C), which is dropped for the purpose to an angle determined by the required degree of retraction, the shoulders resting on the thigh section (B), which may be raised by means of the worm gear as desired. The shoulder rests placed in the sockets of the thigh section (B) and in the axillæ of the patient will prevent him from slipping down though seldom necessary because the remainder of the table would ordinarily remain horizontal.

Dimensions. The table is 6 feet long, 20 inches wide, and 36 inches high (most operating tables on the market are too low).

The accompanying drawing is made accurately to scale. The frame is purposely made heavy and strong; the main frame (A, B, and C) is of steel, ½ x 1½ inches. The top is of plain or nickeled brass and ⅛ inch or more thick, with rounded edges and corners.

The worm gears, which should be enclosed, have been used sufficiently on other tables to show that they are much more convenient than any ratchet and pawl arrangement or simple wheel and ratchet, for the nuisance of the pawl is done away with, the friction with the reduction of speed furnishing sufficient stability; besides they admit of much finer adjustment. Similar worm gears are employed in operating the loin elevator which is used in kidney and gall-bladder work. The crank is of course detachable.

SALINE PROCTOCLYSIS APPARATUS

With the Description of the Apparatus as Used in Dr. J. B. Murphy's Clinic

By PAUL B. MAGNUSON, M. D., Chicago, Illinois

The Murphy treatment of peritonitis, since its inception, has given such uniformly satisfactory results and has so greatly reduced the death rate in this much-feared infection, that it seems not only justifiable but urgent to introduce an apparatus by which this treatment can easily be carried out in general as well as hospital practice.

The faults with the present forms of apparatus for administering continuous saline are: First, complexity of parts; second, bulkiness; and third, impractibility of the electric-heated variety, except in rooms supplied by electricity.

The apparatus which we wish to here call attention is very simple. It consists of a vacuum bottle, a combination stand and holder, and a tube of various parts leading from the bottle to the rectal terminus.

The tube is the only part of the apparatus which needs a description. It consists of an air intake tube (G) of glass which extends from the cork to the bottom of the bottle, since it is necessary to invert the bottle, it being impossible to fit a stopcock into the bottom of this variety of reservoir. This air intake tube is connected by rubber tubing to the regurgitation funnel (D), so that regurgitated fluid from the rectum will flow back into the bottle, thus preventing the soiling of bed linen. From the cork, extending in the opposite direction, is the outlet tube of glass (H), connected to the glass dropper bulb (E) below by thick gum rubber tubing. This bulb dropper consists of a small glass tube inserted into a bulb, and enables the nurse to observe the inflow of the solution and control it accurately by a screw clamp (F) on the rubber tube just above the bulb.

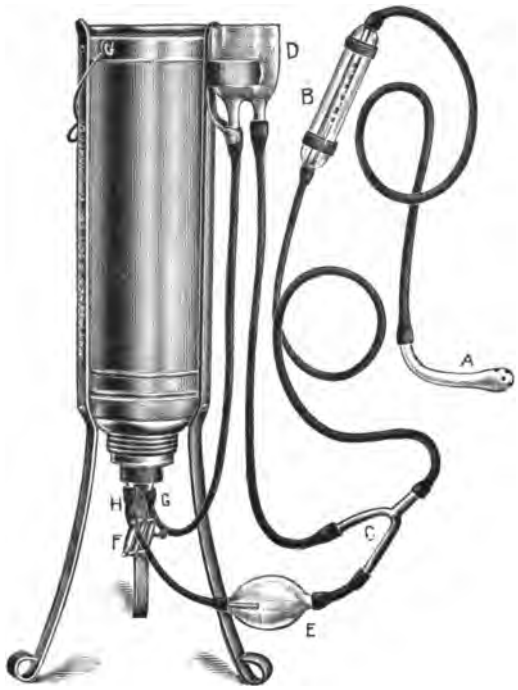
The solution runs from this bulb through another rubber tube to connect with a Y tube (C) below.

One arm of the Y is connected with the outlet, and one with a tube leading upward and ending in a small galss funnel (D) attached to the side of the stand. This tube and funnel act as an outlet for regurgitating fluids and gases, in case the rectum becomes too much distended, and the overflow, as before stated, returns into the bottle.

About nine inches below the tube is a bulb containing a thermometer (B) which is marked in .5 of a degree in plain figures from 90° F. to 120° F. This enables us to tell accurately at what temperature the saline solution is entering the rectum. The rectal tube (A) is made of glass with five perforations one-eighth of an inch in diameter, at its bulbed end, and bent about four inches from the end at almost a right angle. This variety of tube is much more satisfactory than rubber.

A flannel sleeve covers the entire length of glass and tubing, thus retaining heat as the fluid passes through.

The salines are put into the bottle at 140° F.,



the stand slipped over the bottle, the cork put in, and the whole inverted and either placed on a table beside the bed or hung by a hook-rod clamped to the side of the bed.

This is such a valuable, simple, and easy method of treatment in all toxemias, cholemia, stercoremia, septic intoxication, as scarlatina, diabetes, as well as peritonitis, that with an apparatus of this kind much better results should be obtained in the future than in the past. Solutions may be made up in one's office and carried for hours in the corked vacuum bottle and still be at the right temperature when needed. This should appeal to country practitioners, not only for proctoclysis, but for sterile intravenous injections in cases of emergency, where the solution may be kept on hand and ready for use in an instant.

It might not be inappropriate to mention Dr. Murphy's methods, since they have been much misunderstood or carelessly followed, with the result that a very valuable therapeutic measure has been much maligned, not through any fault of its own, but through the ignorance or carelessness of those who did not properly administer it and failed to get "results." Out of fifty-eight consecutive cases of general perforative, suppurative peritonitis treated by Dr. Murphy only two deaths resulted; that is, about three and one-half per cent, instead of eighty to ninety per cent, as formerly occurred.

"First. Fowler position exaggerated at all times from the moment diagnosis is made.

"Second. Withhold all food.

"Third. As soon as the patient is returned to bed after operation, proctoclysis is instituted and maintained until the serious symptoms of intoxication cease. The continuous method is by far the most scientific and successful. Moderate distention is the normal condition of the large intestine. If it is hyperdistended it causes spasm and expulsion of material. The mucosa of the large intestine absorbs water with great rapidity. The retention of fluid in the colon depends entirely upon the method of its administration. We have visited hospitals numbers of times and have been shown patients who were receiving the "Murphy treatment." We should not have recognized it without the label. It is difficult to impress those administering it with the importance of details, notwithstanding that the best results are secured only by close attention to detail. A fountain syringe, to which is attached a three-eighths-inch rubber hose fitted with a hard rubber or glass vaginal douche tip with multiple openings was the medium originally used by Dr. Murphy. This tube should be flexed almost to right angles three inches from its tip. A straight tube must not be used, as the tip produces pressure on the posterior wall of the rectum when the patient is in the Fowler position. The tube is inserted into the rectum on the flexion angle and secured in place by adhesive strips binding it to the side of the thigh so that it cannot come out; the rubber tubing is passed under the bedding to the head or foot of the bed to which the fountain is attached. It should be suspended from six to fourteen inches above the level of the buttocks and raised or lowered to just overbalance hydrostatically the intraabdominal pressure, i. e., it must be just high enough to require from forty to sixty minutes for one and one-half pints to flow in, the usual quantity given every two hours. The flow must be controlled by gravity alone and never by a forceps or constriction on the tube, so that when the patient endeavors to void flatus or strain, the fluid can rapidly flow back into the can, otherwise it will be discharged in the bed. It is this ease of flow to and from the bowel that insures against over-distention and expulsion onto the linen.

"The fountain had better be a glass or graded can, so that the flow can be estimated. The temperature of the water in the fountain can be maintained at 100° by encasement in hot-water bags. The fountain is refilled every two hours with one and one-half to two pints of solution.

The tube should not be removed from the rectum for two or three days, except for bowel movement. When the nurse complains that the solution is not being retained it is certain it is not being properly given; even children tolerate proctoclysis surprisingly well. We have administered as much as thirty parts of salt solution in twenty-four hours, and it was all retained. We believe that, next to the conservative technique of the operative procedure, proctoclysis is second in importance as a life-saver. It rapidly restores blood pressure, it improves the capillary circulation, it quiets the thirst, it eliminates the septic products and increases the excretions. All of the details are simple, but they must be carried out with precision to secure the best results. If the patient has a tendency to vomit, is nauseated, or shows evidence of gastrectasis, lavage should be practiced and repeated often if the stomach refills with fluid."

From "Perforative Peritonitis, General, Free, Suppurative," by J. B. Murphy, Surgery, Gynecology and Obstetrics, June, 1908.

ANÆSTHESIA IN OBSTETRIC PRACTICE

By HERBERT MARION STOWE, M. D., Chicago, Illinois
Associate in Obstetrics, Northwestern University Medical School

When, after the discovery of ether as a means of producing general anæsthesia, several surgical operations had been successfully performed under its beneficent influence, Sir James Y. Simpson was the first to introduce this agent into the practice of obstetrics, by performing a version and extraction on January 19, 1847. Ether was first used in this country by Dr. N. C. Keep on April 7, 1847, in a normal labor, with satisfactory results. Upon the discovery of chloroform by Simpson and its first trial by him on November 8, 1847, the use of ether was discontinued by the profession. Simpson recommended chloroform as being "more speedy and perfect in its action, more agreeable in flavor, less irritating in its administration, and more transient in its effect."

From the time of Simpson, chloroform has been preferred to ether in obstetric practice by the great majority of obstetricians and physicians in general, for the reasons advanced by its discoverer. This practice is general at the present time. However, various fatalities and scientific investigations of the results produced by chloroform narcosis have cast serious doubts upon the alleged superiority of chloroform over ether. It is a well known fact that chloroform is much more dangerous as a general anæsthetic than is ether in surgical operations, and for this reason surgeons prefer ether when pulmonary complications are absent. The same rule should apply in obstetric practice, for both normal and operative deliveries are of necessity surgical proceedings.

The comparative effects of ether and chloroform upon the uterine contractions are somewhat similar. Both lower the intrauterine pressure in obstetric narcosis. In surgical anæsthesia, the uterus under chloroform is paralyzed, or its contractions become very weak and the intervals long. Under ether, the intrauterine pressure is decreased in lesser degree and the interval is lengthened accordingly. The patient recovers quickly from chloroform anæsthesia more quickly and it becomes necessary to administer more of the drug to prolong the narcosis. Under ether, on the other hand, the patient awakes to consciousness more gradually and it is possible to suture a lacerated perineum or cervix without resorting to more anæsthetic — a valuable point in favor of ether. The uterus recovers from the ether anæsthetic, according to Hensen, in from five to twenty minutes, and from chloroform narcosis in from one to two hours. The danger of post-partum hæmorrhage after chloroform is a well-recognized fact, and its explanation is found in the effect of chloroform upon the uterine ganglia and musculature. Undoubtedly, many cases of serious and fatal hæmorrhage have occurred from uterine atony as an indirect result of the anæsthetic.

Recently, several investigations have been made concerning the cause of death after chloroform narcosis. As a result of these studies, it has been determined that chloroform produces a condition of hepatic toxæmia similar to that of phosphorus poisoning. The symptoms make their appearance in 10 to 150 hours after the withdrawal of the anæsthetic. The symptom-complex consists of vomiting, restlessness, icterus, cyanosis, and Cheyne-Stokes respiration. Bevan and Favill state that chloroform especially, ether to a slight extent, produces a destructive effect upon the liver, kidneys, cardiac muscle, and other muscles of the body, resulting in fatty degeneration and necrosis. The chief lesions are localized in the liver cells. Their

synthetic function is destroyed. Autolysis of the cells follows with resulting alteration in the liver structure. The various products of autolysis — amido and other organic acids — are detected in the blood and urine. Wells believes that it is probable that the oxidizing enzymes are particularly involved and account for the marked fatty changes that are present in this condition. The hepatic lesions are in direct proportion to the amount of anæsthetic given and the duration of its administration.

As is well known, the liver is the central organ of metabolism, and its cells constantly transform injurious and irritative material into comparatively harmless substances, until they can be eliminated from the system. Should the hepatic cells be limited in their functions, toxins will be formed that are certain to exert a pernicious influence upon the organism in general. If the vital powers are lowered by certain constitutional dyscrasias, as diabetes, diphtheria, sepsis, and wasting diseases, hepatic autolysis is prone to occur.

Pregnancy exerts a profound impression upon the maternal organism in general and the liver in particular. Every pregnant woman is toxæmic and no liver is able to do its full duty during gestation. The extra burden of eliminating the excreta of the mature fœtus from the mother after a continuous strain of eight or nine months necessarily produces certain changes in the liver cells. When liver insufficiency is marked and the patient dies from pernicious vomiting, eclampsia, or acute yellow atrophy of the liver, the pathologic changes are nearly identical with those following death from chloroform poisoning.

The administration of chloroform at the time of labor tends to increase those pathologic changes in the liver — fatty degeneration and necrosis — heart, kidneys, and muscles generally that when sufficiently pronounced lead to the post-mortem picture of eclampsia and acute yellow atrophy, by compelling the weakened liver cells to synthesize the destructive and irritative products carried in the blood. If the hepatic cells are unable to perform this function, they are themselves acted upon by the products and undergo fatty degeneration and necrosis with serious results to the patient.

It may be possible that the free use of chloroform in eclampsia determines a fatal termination in those cases where the patient suffers from convulsions after delivery, or where the coma deepens and is accompanied by a steady decrease in the excretion of urine. From our present light, at least, the pathologic effects of chloroform narcosis add to the lesions produced by the eclamptic condition. If this theory is true, the choice of an anæsthetic in the borderline cases will determine the ultimate outcome of the disease.

The poisonous effects of anæsthetics in labor depend primarily upon the quantity given and the length of the narcosis. General anæsthesia should not be administered during the first stage, because of its liability to prolong the period of dilatation and increase the danger of fœtal asphyxia. During the second stage, ether may be administered in small doses until the acuteness of the pains is overcome. As the fœtal head becomes visible at the pelvic outlet, the anæsthesia can be increased so that the delivery can be accomplished without conscious pain.

If an operative delivery is necessary, ether should be used on all occasions unless pulmonary complications are present. The relative safety of this anæsthetic as compared with chloroform should outweigh all its lesser disadvantages.

While various appliances are recommended for the administration of ether, a simple and efficient contrivance consists of two rectangular pieces of cardboard enveloped in a towel so as to form a cone which fits the face snugly. The apparatus is similar to a book cover with the short ends secured by safety pins. Several small pieces of gauze are placed within to retain the ether. During normal labor, when slight anæsthesia only is indicated, the open method is preferred. The ether is well mixed with air, and toxic effects are extremely rare. Care should be taken to remove all foreign bodies from the mouth and secretions from the nasal passages. For the obstetrical degree of ether anæsthesia, the mask may be held by the nurse, physician, or patient herself. A few drops are given at the onset of each contraction. When the required degree of anæsthesia is obtained, little more need be added. It is impossible to induce surgical anæsthesia by this method.

For operative deliveries, the anæsthetic should always be given by a physician if possible. The ether cone is applied to the oiled face and a towel folded around it to exclude the air. The ether is then poured into the cone at the back. The quantity of air inspired can be regulated by opening or closing the back of the cone.

One of the greatest objections to ether is the vomiting. During delivery, vomiting is caused by the swallowing of mucus impregnated with ether fumes. Sufficient ether should be given to prevent vomiting at this time. Vomiting after delivery is concluded is more frequent after ether, but is more transient and less apt to recur. Patton states that severe and prolonged vomiting is more common after chloroform.

Much can be done to prevent vomiting and by

careful preparation of the patient and the judicious administration of the anæsthetic, vomiting will be the exception rather than the rule. We should use as little of the anæsthetic as possible. By the open method, few patients suffer from vomiting. If the patient has swallowed much mucus, this may be removed from the stomach by a pump while she is unconscious. If the patient vomits after the return to consciousness, she may drink a quantity of hot water, and as this is ejected, much of the mucus will be removed and the patient is relieved. The patient should lie on the side with the face down so that mucus or ejected material can be removed from the mouth and throat. She should be moved as little as possible, as vomiting is frequently increased by motion. Many patients are unduly exposed in obstetric operations, and these are liable to contract pulmonary complications. The body temperature after delivery should be maintained by artificial means, especially if the vital powers are depressed.

The great danger of ether pneumonia has been urged as a contraindication to this form of anæsthesia. Owing to its irritant action on the respiratory organs, ether should not be given in inflammation of these tissues. Prescott of Boston found three cases of ether pneumonia in 46,000 anæsthetics, while Silk of London saw thirteen in 5,000 cases. Gurlt of Berlin collected thirty cases in 52,177 cases. Other writers give a higher percentage. We may state, therefore, that ether pneumonia is the rare exception, and when given by competent men can be practically excluded from the list of accidents.

The mortality statistics are largely in favor of ether. The combined reports of Gurlt of Berlin, and Juillard of Geneva, give 341,058 ether anæsthetics, with twenty-three deaths, while the report of the Committee of the British Medical Association (1900) gave 4,595 cases with six deaths, and none due solely to the anæsthetic. On the other hand, Gurlt and Juillard collected 691,329 chloroform administrations and found 224 deaths.

CONCLUSIONS

1. Ether should be used as an anæsthetic in obstetric practice when pulmonary complications are absent.
2. Its action upon the uterine contractions in the second stage of labor is preferable to that of chloroform.
3. No anæsthetic should be given in the first stage of normal labor.
4. Uterine atony and post-partum hæmorrhage are rare following ether anæsthesia.
5. Ether should be used in eclampsia in preference to chloroform. Its action is as positive and the danger much less.
6. Ether is far safer to the mother than chloroform. The danger of delayed poisoning is rare.
7. The indication for the use of chloroform in obstetric practice will be greatly limited in the future, when its toxic effects upon the vital organs are better understood.

TRANSACTIONS OF SOCIETIES

CHICAGO SURGICAL SOCIETY

REGULAR MEETING HELD DECEMBER 3, 1909, WITH THE PRESIDENT, DR. ARTHUR DEAN BEVAN IN THE CHAIR

GUTTA-PERCHA TISSUE IN SURGERY

BY JACOB FRANK, M. D.

Dr. Jacob Frank gave a short history of gutta-percha, which was first brought to the notice of western civilization in 1656; to be re-introduced in 1843 by Dr. William Montgomery, English resident physician at Singapore. A report by a commission appointed by the Academy of Medicine, Paris, in 1849, to investigate the value of gutta-percha instruments was reviewed. Dr. Frank called attention to the fact that gutta-percha tissue can be successfully used for more purposes than any other one material employed by the surgeon. That the well-known cigarette drain was but an item in the many uses that could be made of it. Modification of the cigarette drain and their various uses were explained and discussed. The value of the gutta-percha tissue spiral as an aid to repair of tissues, as well as a decided addition to the comfort of the patient, was shown. Of especial value was the result of bacteriological experiments which were carried out to demonstrate means of sterilizing this tissue. These experiments showed that neither carbolic acid, lysol, or alcohol killed the various organisms employed in the experiments; but that a chloride of mercury solution, one to one thousand, effectually killed both spore and non-spore producing bacteria in twenty-four hours, while in no way injuring the gutta-percha tissue.

DISCUSSION

DR. E. W. ANDREWS: I am interested in the test of antiseptics in preparing gutta-percha. It shows that 50 per cent alcohol had far more antiseptic power than the concentrated 95 or 97 per cent, and that the phenol solution of full saturated strength, that is to say, 5 per cent, was not absolutely antiseptic.

I think we all remember that gutta-percha was exclusively used years ago in surgery. I saw a great deal of it used in sheet form such as dentists employed in their work. They used the ordinary red colored sheet pure gum, tinted red or pink. It was about two millimeters in thickness. Gutta-percha gum can be strongly contrasted with any other similar material, in that it is perfectly soluble in certain solvents, such as bisulphide of carbon, acetone, etc., and other agents. It is inelastic and plastic. It can be softened by one of the solvents, so as to be useful as a coating or varnish for skin surfaces. Unlike rubber, it can be dissolved and also can be softened by mild heat. These sheets that I speak of are of the thickness of light pasteboard, and have a marked rigidity when cold. They are almost as rigid as fairly strong mill-board or pasteboard. It only requires a temperature a little above body heat, say 120° F., to make them soft and plastic, so that the sheets are beautifully adapted to the making of small splints for the hands and fingers.

The best use I have ever seen for gutta-percha tissue is for drains. We have substituted these almost altogether for gauze strips in a form like tapers or "lamp-lighters," making the strips long and narrow by folding the tissue two or three times. A bundle of such "lamp-lighters" will form a better drain in the abdominal cavity than gauze strips. You have probably all seen a bundle of gauze strips taken out with pain and difficulty. Unlike the latter, these gutta-percha tissue strips do not form adhesions to the viscera.. They drain fully as well as gauze strips. After a day or so gauze strips cease to drain. They become non-porous. This is not so with gutta-percha tissue strips, and it seems the thicker the fluid, or the more coagulant it is, the less the gutta-percha tissue strips become agglutinated. Nothing sticks to them. They continue to drain for a long time. One fault they have is their frail texture. I remember once breaking one of them off in an attempt to pull it out. Gutta-percha tissue tears and stretches very easily. It is not much stronger than paper. I broke off one of these in the

abdomen after an operation, but was greatly relieved a day or two later, after taking out a deep stitch, to be able to fish it out with forceps. If I had not, it would have prolonged the suppurative condition.

DR. D. W. GRAHAM: I do not use the gutta-percha tissue as much as formerly. In hospital practice paraffine paper is a good substitute and much cheaper. I refer to the use of crude gutta-percha which I have used with great satisfaction in fractures of the jaw. Immersed in hot water for a few minutes this material becomes soft like putty, and can be easily and quickly shaped by pressure into an interdental splint which will be quite as efficient though not as artistic in appearance as that which a dentist would make.

If one must use protective strips for Thiersch skin grafts the gutta-percha tissue is probably the best material. But I have not used the protective strips in skin grafting for a long time, for I am satisfied they are worse than useless. So with the salt solution and the wet dressings. The grafts when placed on a clean recent wound are covered with simple, flat, sterile dry gauze which is not renewed for eight or ten days, when the grafts will be found firmly grown to the surface beneath. The surface from which the grafts are taken is dressed exactly in the same way and the dressing not removed until new epidermis has formed, eight or ten days later. When the grafts are placed on a granulating surface, there will be less suppuration and fewer grafts lost by using the same sterile dry gauze without the protective strips than with them. But in this kind of case the dressings should be changed every two, three, or four days, according to the amount of pus one expects from the granulating surface. In changing these dressings the grafts can be left undisturbed with a little extra time and care, quite as well as if protective strips had been used.

DR. ARTHUR DEAN BEVAN: Dr. Frank's paper is very timely. About ten years ago I remember seeing the greatest master in surgical technique I have ever seen — Dr. Charles McBurney — use gutta-percha tissue for drainage, and from that time on I have adopted it, practically discarding tubular drainage entirely in surgical work, with the exception of some special cases. The use of gutta-percha tissue in the form of cigarette drains, and spirals and strips has practically revolutionized the whole subject of drainage within the past few years, and gutta-percha tissue can be very thoroughly sterilized by bichloride solution, as Dr. Frank has said. In our hospital it is our custom to have the gutta-percha sheets in bichloride solution for weeks at a time, and we have never had any trouble with it. It is non-irritating, is not likely to produce pressure necrosis, and in our clinic, even in amputations of the thigh, instead of using the old fashioned tubular drain, a little sheet of gutta-percha is folded up and tucked in the lower angle of the wound, and is not removed until the end of ten days. It is not removed, as a rule, until the stitches are removed, and it certainly answers better for the purpose of drainage than any other substance we have ever employed. The same thing can be said with reference to goiter work, and of all neck work in general. I have seen one fatal case from a drainage tube used in the neck. I do not think a drainage tube should ever be used in the surgery of the neck, on account of the danger of pressure necrosis. Gutta-percha tissue offers the very best drainage material.

DR. FRANK (closing the discussion): I wish to make a few remarks with reference to the use of dry gauze on grafts and granulating surfaces. I used dry gauze in that manner before I adopted the use of gutta-percha tissue. Formerly, when I applied dry dressings on granulating surfaces I knew very well, before I got to the hospital, what would happen when I began to remove the gauze from the raw surface. The patients would cry and yell in pulling off the dry gauze from the granulating surface. It is not only very painful to the patient, but it is distressing to the surgeon to hear the piteous appeals of these patients when we are pulling it off. Another reason why I discarded the use of dry gauze on granulating surfaces is that we cannot remove it without opening up new foci of infection, because it will stick.

If Dr. Graham will try gutta-percha tissue on raw surfaces he will like it, and I am sure his patients will. There is nothing more painful than to remove dry gauze when it becomes adherent to a granulating wound.

DR. CARL BECK read a paper entitled "Osteomyelitis and Its Treatment." (See p. 113.)

DISCUSSION

DR. A. J. OCHSNER: This is certainly one of the most instructive demonstrations we have had before this society. We have given very little attention in this society to osteomyelitis, and still it is a most practical subject, and should be thoroughly discussed. The importance of this demonstration lies in the fact that Dr. Beck has impressed us with the possibilities — as well as with the necessity — of a definite diagnosis. This method of diagnosing cases of chronic osteomyelitis is most effective.

As regards the operation itself, the illustrations show that some of the older methods, particularly

the one introduced by Schede, and the one by Prof. Senn, are better than those which have been practiced in these cases. Let us take the case of osteomyelitis of the femur, in which we have a sequestrum occupying the lower third of the shaft of the bone. One of the important things Dr. Beck has shown us is that he can determine whether the dead bone is in the upper or lower portion, or the outer or inner side of the bone. No matter in what location the dead bone may be, I believe that one is likely to leave small portions of sequestra, as was very evident by these skiagrams, unless one has previously determined the exact location of each portion of the sequestrum and unless one makes an extensive exposure. The use of Beck's paste is an advantage over the use of decalcified bone and over the Schede blood clot in the treatment of the cavities left after removal of sequestra.

With regard to early operation, from what Dr. Beck has told us, one might suppose that in case the shaft of the bone of the humerus, for instance, were virtually destroyed early during the progress of the disease, then it should be removed, but that would be conveying a wrong impression. Some fifteen years ago a number of surgeons regularly removed the entire shaft in acute osteomyelitis whenever it seemed to be dead. As a result of this practice there were many deformed legs and arms. Even two years ago I saw a noted surgeon in the southern part of this country demonstrate a number of such cases in his clinic. The legs of these patients were absolutely useless. Unsuccessful attempts were made to repair the condition by implanting portions of bone from amputations, etc. If the incision had been made through the periosteum down to the bone, the greatest portion of the shaft of the tibia, for instance, would have been entirely restored, and only small portions would have become sequestrated and would have required removal.

The sequestrum can be readily removed six months later when the involucrum is sufficiently strong to support the weight of the body.

DR. D. W. GRAHAM: We know that the pus in some of these cases of osteomyelitis is very close to the joints. In the lower end of the femur, we know that the onset and activity of the disease is just above the epiphyseal cartilage. That is pretty close to the joint, and pus not infrequently burrows all around the periosteum. If we go through in front we are almost certain to open into the bursa that is under the quadriceps tendon. In many cases we would do this, and probably cause infection of the knee-joint, for this bursa often directly communicates with the joint. For this reason, if for no other, I think the anterior incision objectionable. If we open above the bursa we are too high to get at most of the pus, in the early acute cases, and if we are operating to remove sequestra and carious spongy bone near the epiphyseal cartilage, we are too high to permit a complete removal.

DR. W. R. CUBBINS: There is one thing that occurred to me which skiagrams might not show clearly, and that is in the case of a heavy man who has used the limb constantly and developed a very heavy involucrum.

I have had two cases of sequestra. In one, the dead bone was shown perfectly by a skiagram and the piece removed without difficulty. This, however, was in a slight man who had not used his limb very much. In the next one it was a heavy man whose osteomyelitis had existed for forty-six years. In this case there was such a marked sclerosing osteitis that the cavity containing the sequestra or sequestrum was not visible. The shell of bone was at least three-quarters of an inch thick. I would like to know if the doctor has seen a case of this type.

DR. E. W. ANDREWS: This paper is full of new and interesting data. We ought to spend considerable time in discussing it. One thing new to me is the median incision to reach the femur through the center of the quadriceps muscle and tendon. It looks good to me. I have always practiced the outer incision, sometimes of necessity going pretty nearly the whole length of the bone from knee to hip. I had supposed that the inner aspect was too dangerous on account of the vessels there, Hunter's canal and nerves. I had also thought the posterior incision was dangerous on account of getting too near vessels and the popliteal space. Certainly, the outer region does not let us in between two muscles. We find that the vastus externus spreads out fanlike, and before there is any uncovering of the shaft we cut a lot of muscle fibers transversely. If we can get the bone laid bare without cutting muscle tissue, but only splitting it, the advantages described appeal to me very strongly.

DR. DANIEL N. EISENDRATH: I do not understand one point which Dr. Beck has made. In the skiagrams which he has shown us the light areas look like abscess cavities, and he has called them sequestra. Undoubtedly he means the darker shadow showing the sequestrum.

DR. M. L. HARRIS: This is a very valuable presentation by Dr. Beck, and from it two or three valuable lessons may be drawn. The first is that the operating surgeon should be the one to interpret the X-ray picture. The value of the X-ray picture depends entirely on the interpretation,

and the one who takes the picture with him to the operating room, and is constantly comparing it with the conditions found, is the best interpreter of the picture. The second lesson is that the success of operating on osteomyelitis consists in removing all of the diseased process. and as these X-ray pictures have shown us repeatedly to-night, this is only possible in some cases, in fact, in many cases, by a careful study of the X-ray pictures, so as to be able to locate all of the diseased area before the operation is made.

DR. BECK (closing): With reference to the question asked by Dr. Cubbins: I saw one case in which the bone was so dense that there was no spongiosa present. In chiseling, the instrument cut through sclerotic tissue. The condition had existed for many years. While we overlooked the cavities in the first picture, in the second picture, taken shortly afterwards, three cavities could be seen. I spoke of that case during the demonstration, it was the case in which I broke off the scoop.

As to the anterior incision, I am positive you can, by adopting a certain surgical technique avoid getting into the joint, even though you get close to the cartilage, by incising the tissue and separating the capsule very much as you do the peritoneum in a suprapubic incision. I have done that a number of times, and have never had an accident in opening the joint, although I have practiced it in recently septic and old septic cavities. If we operate on an acute case we will probably find the abscess mostly in the posterior region, or on the side, but there is no necessity to open the limb on that side. The reason the incision has always been made here before is that fluctuation was on the side where the abscess had broken through the bone, and the incision being made here and widened, then the surgeon removed the sequestrum through the opening of the bone. But where the sequestrum reaches over to the other side you get a perfect view from above and you can chisel down to the neighborhood of the joint without opening the joint, and empty the whole cavity.

So far as sequestrum is concerned, Dr. Eisendrath misunderstood me. I spoke of two shadows. (Drawing on blackboard.) Here is a drawing showing normal bone. If I compare this normal bone with the pathologic, the normal shows a shadow on both sides (pars eburnea), in the center it would show the spongiosa a lighter structure, and therefore shows less density. If there is a sequestrum, such as we see in any one of these cases, then we observe a double contour with a light area in the center. If there is nothing but a light area it is only an abscess. If it shows white parts, these are the coherent parts of the sequestrum of the bone which we remove afterward.

THE PRESIDENT: Inasmuch as your paper deals with the treatment, I wish you would say a few words in regard to the part bismuth plays in the treatment.

DR. BECK: I thought I would not say too much on that subject. Recently Reich from Bruns' clinic has published an extensive paper in which he speaks of bismuth poisoning. The paper contains some very interesting material. He is of the same opinion that I am, namely, that bismuth paste is not a perfectly harmless agent in the hands of every practitioner, and that it should be used very carefully inasmuch as there are possibilities of poisoning. As to the question of poisoning, we have probably made as many injections as anybody else, yet we have not had a case of fatal poisoning. We have observed our cases carefully; we have selected the amount of paste to be used, and we have been very careful as to the manner in which it was injected. I may say, we have injected the bismuth paste near the cranial cavity, we have injected it into the pleural cavity, and into the lung, and we have had patients spit up large quantities of it. We have injected it into sinuses, communicating from the outside, and we have not had any bismuth poisoning. If a practitioner takes a syringe and squirts the paste into a sinus with all the force he has at his command, then that will be probably sufficient to tear open some non-resistant tissue, or perhaps rupture some blood-vessels, and he will have bad results, particularly if he uses large quantities, particularly if the bismuth paste is not aseptic. I believe some of the unfavorable results reported have been due largely to the paste not being aseptic before it was injected. There have been cases of bismuth poisoning reported abroad and in this country after the most careful treatment and technique had been followed. In these cases the paste was injected undoubtedly into large cavities where the mass would easily be absorbed. On the other hand the bismuth paste may have contained arsenic or some other material, which produced the symptoms of poisoning.

The treatment is simple. After you have used an injection of this paste once in a bone cavity you will like it very much, because it will prevent constant suppuration. After its injection the cavity will only secrete a little serum on the second and third day, and afterward it will not secrete at all. Only dry material will come out. But these are the cases in which no sequestrum has been left behind.

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING HELD NOVEMBER 19, 1909, WITH THE PRESIDENT, DR. CHARLES B. REED, IN THE CHAIR

HERBERT M. STOWE, M. D., EDITOR

SPECIMEN OF A CASE OF TRUE HIRSCHSPRUNG'S DISEASE

BY CARL WAGNER, M. D.

The specimen of giant colon was removed from an infant two years of age, and represents the first case on record in the United States of genuine Hirschsprung's disease.

Definition of the disease. Hirschsprung's disease, or mega colon, manifests itself in a persistent high grade of obstipation and large distention of the abdomen which is caused by an enormous dilatation of the sigmoid flexure and of the colon. The symptoms are observed either right after birth or develop during the first months or years of life. Very rarely has a similar condition been observed in adults. The disease has terminated in by far the greater number of cases in death, which was often preceded by colitis and the development of numerous ulcers caused by stretching of the dilated colon.

While in the adult the length of the colon measures about 130 to 145 cm., in this case we find it 154 cm.; sigmoidal sac 21 cm. in diameter; colon descendens 15 cm. in diameter; colon transversum at several places 20 cm. in diameter; the rectum 2 cm. in diameter, and ileum 1 cm. in diameter. The mesentery was abnormally long and the blood-vessels in it were very large.

The sigmoid, with its colossal circumference, abruptly narrows at its distal end to assume the proportions of the normal rectum. The effect of the sudden termination is not unlike a child's toy balloon, the rectum being the small opening by which it is inflated. The small rectum, with its thin walls, is in very marked distinction to the enormously enlarged hypertrophied sigmoid lying directly above.

The patient reacted splendidly after the operation. There was no vomiting at any time. Patient took nourishment the second day and was quite bright, sleeping at intervals, with normal pulse and normal breathing. Gases passed freely. Everything went along very satisfactorily for 32 hours, when with a sudden gasp the patient turned to the side and died without symptoms. Cause of death, embolism.

GALL-BLADDER OPERATION WITHOUT GENERAL ANÆSTHETIC

BY CARL WAGNER, M. D.

Concerning gall-bladder operations without general anæsthesia, since Lenander's (Upsala) stimulating publications on the study of the sensibility of the different abdominal organs, very many various and contradictory reports have appeared from other observers, which proves that our state of knowledge on this question is quite chaotic. It might not be amiss, then, to submit a contribution to this interesting subject.

Last week I performed a gall-bladder operation under local, instead of general anæsthesia, on account of the condition of the patient's heart, and a severe kidney lesion. The patient, 40 years of age, was very frail, had been under the care and study of our internist, Dr. Small, who had made a diagnosis of infected gall-bladder, and advised operation. The application of Schleich's solution had but little effect on the skin. Incision through the muscles caused intense pain, which was, however, only of momentary duration. The fascia reacted some, but far less than the muscles. The incision of the peritoneum was not felt at all, nor the opening of the gall-bladder, but traction on the gall-bladder or on the parietal peritoneum caused very severe pain. When, however, the peritoneum was held steadily with the artery forceps clamped to it, the patient informed us that she felt nothing, not even the pressure of the forceps. Pressure and displacement of the liver was each time accompanied with a severely painful response, which, however, might have been to some extent due to the congested condition of the organ. Exploration of the deeper bile tracts, cystic and common ducts, disturbed the patient very little. Examination of the pancreas gave her sharp and piercing pains, in spite of the fact that no pathologic change had taken place in this organ. Eventration of the stomach, duodenum, colon, and omentum was hardly perceptible to the patient. But traction of the cæcum produced a

sharp outcry, in spite of the fact that the bowel in question and appendix were normal. The insertion of laparotomy compresses into the abdominal cavity brought no complaints, but the pressure of the sponges upon the cut edges of the abdominal wall was not tolerated very well. The insertion of the tube into the gall-bladder, and the placing of the purse-string around the gall-bladder left her very tranquil. Directly after the completion of the operation, as well as all the time since, the patient states that she has not experienced any uncomfortable feeling whatsoever, a fact which at first seems very strange, compared to the intense suffering which we observe in most cases of operations for gall-bladder diseases done under general anæsthesia, and it seems to me from this experience that the more careful and less handling of the peritoneum in this case might serve as an explanation, because every time the patient reacted upon the slightest traction of the peritoneum we immediately allowed a few moments for rest, and exercised more care from minute to minute, in regard to this deleterious element of traction of the peritoneum. It is noteworthy that neither during the operation, nor at any time after it, did nausea or vomiting ensue.

SPECIMEN OF EMBRYO OF SEVEN OR EIGHT WEEKS, WITH PLACENTA OF FIVE OR SIX MONTHS DEVELOPMENT

By A. McDERMID, M. D.

The patient under discussion is 26 years of age, married five years. Has had one miscarriage and two children; youngest born July, 1908. She began to menstruate in November, 1908, and did so regularly till February, 1909, when conception is presumed to have occurred. The patient sustained a fall in June or July, hurting her back, but suffered no other ill effects. She began to flow in June and continued to do so without missing a single day until the night of October 25th, when I was called on account of severe hæmorrhage. She stated she had had a similar hæmorrhage a week previously. I applied a tampon and sent her to the hospital the following morning. She was faint and exsanguinated. There were no labor pains. The fundus reached nearly to the umbilicus corresponding to about a five and one-half months pregnancy. Administering chloroform, I found a central placenta prævia, dilated the cervix manually, perforated the placenta, and was surprised at not feeling the limbs or any portion of the fœtus. I was able, however, in 25 minutes from commencing the chloroform, to extract the placenta and membranes. We then discovered this embryo of the 7th or 8th week of pregnancy, being one inch or less in length. You can see indications of the eye and ear and of the budding extremities. The umbilical cord is scarcely two inches long. The placenta on the other hand shows a development of 5 or 6 months, being 5 x 4 inches in diameter. It contains a number of hæmatomata of the size of a small grape. These are variously described as the result of interstitial hæmorrhage, apoplexy, nfarction, or thrombosis. The interesting feature is the great disparity in size between the embryo and placenta. There is also a placenta succenturiata.

DISCUSSION

Dr. George Schmauch: This specimen is very interesting. Most authors have denied growth of the placenta after death of the fœtus. I have always felt that proliferation of the epithelium covering the placenta does occur. The placenta in Dr. McDermid's case is of the size of a four months' gestation. The embryo appears to be well-developed and not macerated, so that apparently the placenta continued to grow without a corresponding growth in the fœtus. No hæmatomata appeared to be present.

Dr. Rudolph Holmes: Nine years ago, in Vienna, I saw a case of development of the placenta with an accumulation of liquor amnii out of all proportion to the size of the fœtus, which had been dead some considerable time without any maceration. There have been a few cases reported of death of the fœtus, with continuation of placental growth. The report was that the fœtus had died, but for some reason did not macerate, and was not absorbed, a condition I believe first described by Breus. Ordinarily, in death of the fœtus without abortion, within the first weeks of pregnancy, there may be entire absorption of the fœtus. I believe this is an example of Breus' "tuberöse subchoriala Hämatom der Decidua."

Dr. Kolischer: This case was first described by Neumann as one of hæmatomata tuberosa placentalis.

PREMATURE DETACHMENT OF NORMALLY SITUATED PLACENTA

By MARK T. GOLDSTINE, M. D.

DISCUSSION

Dr. Rudolph W. Holmes: This is a subject in which I have been very much interested, because in 1900–01 I worked nine months gathering material, tabulating cases, studying them and then making deductions. There is no question that premature detachment of the placenta as a pathologic entity occurs about once in one hundred cases; at least if one carefully examines all placentæ, one will find clots on the maternal surface which have existed some considerable time, sometimes for such a long period that the hæmoglobin is absorbed and putty-like masses remain. In other cases there is a material hæmorrhage of the size of a hen's egg, or larger, without any symptoms on the part of the mother. These instances are of pure academic interest.

The clinical cases are undoubtedly less frequent. Up to four or five years ago I maintained that ablatio placentæ was more frequent or as frequent as placenta prævia. I have been convinced, however, that it is not as frequent as placenta prævia. It was merely an accidental circumstance that the cases I had aggregated the number of cases of placenta prævia. Dr. Goldstine is a student of the Rotunda, therefore, looks upon this question from the Dublin viewpoint. During a short stay at the Rotunda one of the ex-assistant masters told me that in the years he was associated with the institution he had seen many cases which were denominated premature detachment of the normally situated placenta, but had seen very few really typical instances — that many of the cases were high lateral prævias. In Vienna I was told that a typical ablatio placenta was very rare. I have been fortunate in seeing some nine or ten characteristic cases. Locality seems to have an inexplicable relation, for Dublin frequently has the cases under discussion while Edinburgh and Glasgow have them less frequently.

I think accidents have very little to do with the trouble, as was originally pointed out by Ramsbotham many years ago: most of the case reports I have read in which the causal factor was some accident could not have been thus due unless there were some marked pathologic change of the decidua serotina. Pathology bears a more rational connection than the many absurd explanations advanced by writers of even very recent times.

One of the things I learned from the study of my accumulated cases was that there are two types of ablatio; one, the absolutely concealed hæmorrhage, of which there are something over a hundred on record; the other, the relatively concealed type, in which there are external evidences of bleeding. The former type must be of exceeding difficulty of recognition, for such a goodly number only were recognized on the post-mortem table. The patient may collapse, and then dies; at the post-mortem examination the uterus is found filled with blood, not a drop of which escapes externally. This form may very easily be considered by the careless a case of fainting or perhaps heart disease. In the relatively concealed type, the amount of blood which appears externally has no relation to the amount of intrauterine hæmorrhage. The woman may have terrific bleeding externally, or she may have a very slight patent hæmorrhage, yet after delivery enormous clots of blood escape showing that there was retention of blood within the uterus. My collation of cases showed that in most instances of the relatively concealed type there was retention of blood, formation of clots, and their expulsion post-partum: if such fact were not noted in the case reports, an opinion based on my nine or ten cases shows that the absence was due to faulty observation or a failure to appreciate the value of this almost pathognomonic sign.

The symptoms of the concealed and relatively concealed are identical, barring the one sign absent in the former — the external bleeding. The symptom complex is identical in both — in both we see the same degree of stretching and tearing pain located within the uterus as though the organ were about to rupture: whether the uterus was hard or flaccid, whether the accessory tumor developed or not, whether the escape of blood serum occurred or not, whether the symptoms of blood loss were slight or severe, offer no differentiation between the two types — the sole and fundamental difference between them lies in the manifestation of external bleeding. Further, the external hæmorrhage is only a corroboratory sign of internal bleeding. Again, the amount of blood escaping never should be the gauge of actual blood loss, because it does not bear a relation to the amount flowing from the uterine sinuses. The cervix is apt to be flaccid, due to the anæmia, and the labor induced by the irritation from an overdistended uterus. One of my patients who had a particularly typical form had one finger dilatation, yet the cervix was so relaxed that it was possible to dilate the os, perform version and extraction,

manual removal of the placenta, utero-vaginal tamponade within twenty minutes.

I cannot agree with Dr. Goldstine that ablatio placenta is easy of recognition — the fact of the reputed rarity of the condition is sufficient evidence of the difficulty of diagnosis. Women will faint, will have pains, may have a "show," and the patient and doctor will believe the onset of labor is at hand; if bleeding is profuse a diagnosis of placenta prævia is generally made. It is a remarkable fact that so grave a disease, frequent as it is, has almost no literature, whereas placenta prævia fills pages of the Surgeon-General's catalogue.

As to treatment — I believe there is one place where the indication is clear and strong to administer ergot before the uterus is emptied, and that is in this condition: it should be given in small doses, repeated; in particularly severe cases with lax uterus I would not hesitate to give a dram. While getting ready for delivery an intelligent hand should practice massage — this is particularly essential if the uterus be flaccid. I believe the membranes should not be ruptured until delivery may be consummated: the escape of the liquor amnii means a lowered intrauterine pressure which may determine increased blood flow. The Rotunda has adopted the use of the tampon with a firm binder as a routine treatment. I never have seen a woman who would tolerate a *tight* abdominal binder — and I have never seen a uterus, contracting and relaxing as it will, held in place by a binder, even though it be supplemented with a horse shoe pad.

A woman may die undelivered without any blood appearing at the vulva — the uterus being enormously distended. One observer found a case where the woman had two gallons (!) of blood in the uterus — an absurdity — yet she recovered. We know that absolute concealment may be brought about by one of the four methods first explained by Goodell; the same may be brought about by the tampon; whatever tonicity the uterus may have it is definitely certain that the uterus is not so completely "filled" in the interval of contraction as at the height of uterine action; therefore, the tampon is no security against bleeding from the uterine sinuses. To my mind the conversion of a patent hæmorrhage into an occult one is questionable treatment for ablatio placenta.

I believe the procedure indicated is a very clear and definite one if the patient is at all in a critical condition; give saline solution, massage of the abdomen with support of the uterus by an intelligent hand, when preparations are completed, deliver in the most rapid manner possible. Manual dilatation is generally easy on account of the relaxed condition of the cervix; to do a vaginal Cæsarean section in this condition is hazardous, as it generally must be done blindly due to the flow of blood which has been stored up within the uterine cavity. To my mind an abdominal section would be preferable where the cervix is unduly resisting or actually rigid. When full dilatation has been secured, version and rapid extraction should be carried out — strong fundal pressure being an adjunct to the delivery. As endometritis plays such an important role in the etiology there may be a firm placental adhesion in part, although a considerable portion may have been separated in the process of premature detachment. Therefore, manual removal of the placenta should be the rule; directly thereafter the firm utero-vaginal tamponade should be employed.

Dr. Hengge, Munich, Germany: I was surprised at the large number of cases observed by the author. I have seen few of them. The favorable results from tamponade are also surprising. In Germany we divide the treatment into the home treatment and the clinic treatment. In the home the treatment cannot be carried out as rapidly as in the clinic. These cases belong to the clinic, because the treatment should be carried out rapidly, and besides, thorough asepsis in the home is difficult. At home tamponade would probably have to be resorted to. We try to deliver every woman in the clinic, because there all the sequelæ can be treated properly, which is not possible in the home. (Translation.)

Dr. A. McDermid: I am glad to know that these cases occur only once in a thousand, because I began to fear that I was not very observing. I cannot believe that they are at all as frequent as placenta prævia. I have never diagnosed a case of this kind, before delivery. I have suspected the condition after delivery in a few cases, because of the enormous rapid post-partum hæmorrhage. If these cases are so common, I surely would have seen some of the fatal cases, but I do not recall a single case, either ante-partum or post-partum. I admit the possibility of the condition, but I have not seen it.

As to treatment, I agree with Dr. Holmes. I would not rely on the binder and tampon unless manual dilatation and rapid delivery were impossible.

Dr. Charles S. Bacon: I think that the division of cases into clinic cases and private practice cases is very proper. There is no question that the surroundings dictate in a measure the method of treatment to be employed. There is no difference of opinion in regard to the treatment of cases

in which the cervix is dilated or easily dilatable. Such cases should be delivered at once. Where the cervix is not dilated and cannot be dilated in a reasonable length of time, we must choose between a surgical operation, some form of Cæsarean section, or accouchement forcé, including rapid dilatation with the Bossi instrument, or the tampon. With modern technique in abdominal Cæsarean section, one would obtain in the clinic better results, as far as the child is concerned, at least, than from the use of the tampon. This is not true in private practice.

One important point in the paper is the description of the technique of tamponade that has been found of value in the Rotunda. We have so little experience in the management of these cases that we must profit by the experience of others. It is rather dangerous to object to points in technique for theoretical reasons. Dr. Goldstine insists on the use of cotton for vaginal tamponade instead of gauze. Cotton that is wet will pack well. One cannot pack the vagina well with gauze, but can with cotton. In regard to the external bandage, I believe that it is very much better than relying on the hand. I suppose that Dr. Goldstine will answer the objection that it is practically impossible to apply the binder and have the patient stand it.

Dr. Frank Cary: I believe these cases, in a severe form, to be very rare. Given a patient in a condition of shock, I agree with Dr. Holmes that rapid manual dilation and turning should be tried, no time being lost in delivering the placenta. If this is impossible, Cæsarean section seems to me to be indicated.

Dr. H. M. Stowe: It is very difficult to apply the binder so that it will force the uterus downward upon the vaginal tampon. It generally presses it backward against the posterior abdominal wall. When the uterine fundus lies close to the costal arch, especially in the primiparous woman, no abdominal binder, however skillfully applied, will exert pressure in the downward direction. It may be possible to exert such pressure with the hand but the maneuver may be difficult and even impossible and to maintain such pressure for a period of hours is most difficult.

It is claimed that the vaginal tampon arrests the hæmorrhage by counterpressure upon the uterine artery. This artery necessarily lies a short distance above the upper extremity of the plug, and the artery and its tissues tend to recede in the direction of the abdominal cavity and counterpressure is not effective. Smyly states that hæmorrhage is arrested by the stretching of the uterine artery over the tampon. It is difficult to conceive how this is possible, as the vessel is enlarged during pregnancy and becomes so tortuous that it can accommodate itself to a certain amount of stretching without interfering with the circulation. It is a physiological fact that the veins are more compressible than the arteries and if stretching is hæmostatic, the action would be more effective upon the uterine vein. This would prevent the reflux from the uterine walls and thus increase the bleeding. The ovarian artery, which supplies a considerable quantity of blood to the placental site, is absolutely unaffected by the tampon either by stretching or compression.

The ideal treatment of the serious grades of this condition is that which calls for the rapid delivery of the fœtus, either through the pelvis or by abdominal Cæsarean section.

Dr. M. T. Goldstine (closing): In regard to the use of ergot: The oxytoxic properties of ergot are doubtful. It is not indicated in any other condition where there is anything in the uterus.

With regard to massage: one can see the futility of massaging the uterus in tonic contraction. If we get any result from the massage, we dislodge the clots in the blood-vessels, which may be checking the hemorrhage to some extent. I would not massage the uterus after the third stage of labor for this reason.

As regards rapid delivery, thirty-three per cent of the women die of post-partum hæmorrhage. It is the exception rather than the rule for the binder and tampon to cause a post-partum hæmorrhage. I stated that the tampon should be left in for a long time but used only as a means of tiding the patient over until an operation can be performed with safety. The great majority of these patients are tamponed for post-partum hæmorrhage after delivery. The tamponing of the vagina first is no more unscientific than the tamponing after post-partum hæmorrhage has occurred. If we can do away with the tampon in the uterus after delivery, I think tamponade of the vagina is more justifiable. In tamponing the vagina we remain in a septic cavity; we do not enter a clean one, as is the case when we tampon the uterus.

As to cases of concealed hæmorrhage, I have seen them. The cervix in a concealed hæmorrhage is never flaccid nor easily dilatable. If not in the best condition, one cannot dilate the cervix quickly and easily. It takes time, and we are decreasing intrauterine pressure and the more chance there is of blood to flow into the uterus.

As regards separating the placenta: in the great majority of cases of accidental hæmorrhage, the placenta is separated entirely and there is no indication to go into a uterus to separate a placenta which is already separated.

SOUTHERN SURGICAL AND GYNECOLOGICAL ASSOCIATION

TWENTY-SECOND ANNUAL SESSION, HELD AT HOT SPRINGS, VIRGINIA, DECEMBER 14, 15, AND 16, 1909. THE PRESIDENT, DR. STUART MCGUIRE, RICHMOND, VIRGINIA, IN THE CHAIR

The Association met in the Ball Room of the Homestead Hotel, and after announcements by the Chairman of the Committee of Arrangements, Dr. Lewis C. Bosher, Richmond, Virginia, the scientific work was begun.

A BRIEF DISCUSSION OF SOME OF THE SURGICAL JUNK DEMANDING FURTHER SURGICAL INTERFERENCE

DR. JOSEPH PRICE, of Philadelphia, stated that a short time ago a patient entered his office, and asked him to re-open her abdomen, and to correct, if possible, a distressing condition that she could bear no longer. Her abdomen had been opened three times, a pelvic operation having been followed by two gall-bladder operations. She complained bitterly of a griping sensation in her epigastric region, followed by nausea and starvation. In a short period of six days he had re-opened four abdomens for post-operative, pathological, and operative sequelæ. Large numbers of these patients were objects of pity and mercy. One of the number had her abdomen opened eight times. Fortunately the late operations were complete procedures, the reproductive organs and appendix were gone, leaving only a ventral hernia, omental and bowel adhesions, to be freed. One of the late operators drained her gall-bladder, leaving a fistula and distressing adhesions. He liberated the stomach, bowel, and other adhesions, exposing the gall-bladder, disorganized and charged with pus; its clean removal would probably result in a cure.

Dealing with surgical junk required more than the ordinary hospital apprenticeship. The operations done by pioneers in abdominal surgery were free of operative sequelæ. The percentage of recoveries was good in the country. He had had the opportunity of seeing a large number of the patients operated upon by the first school of abdominal surgeons. They constituted an interesting group of patients, none of them complaining of those common symptoms of modern operations. The high death rate in the hands of some few operators explained surgically the distressing condition of the few that did recover, but commanded more surgery.

It was needless to detail the variety of pathological complications from the pelvic basin to the pyloric orifice of the stomach in the great variety of surgical afflictions found between those two points; but if dealt with scientifically, according to surgical light, junk would not be the result. In the suppurative forms of disease of the pelvic viscera above the head of the cæcum, and on up to the suppurations about the liver, the advanced thinkers and workers had given us perfected procedures, and, if practiced completely and scientifically, but few uncomfortable sequelæ would follow. It was exceedingly rare to get junk from the operating tables of the experts. There was prolonged and painstaking effort on the part of the clinical schools to correct the common errors and calamities. Our precise knowledge of pathological calamities and the early efforts of relief now gave us about a *nil* mortality.

We must have more prolonged hospital apprenticeship in our young men at the hands of skillful operators. All of our graduates should go through a hospital. The public hospitals, like the private hospitals, should be made clinical schools, and from this clinical schooling, on top of a thorough scientific education, we would get a new class of practitioners, better pathologists, and better diognosticians. The resulting thoroughness, scientific and clinical, would give us a stronger profession with better judgment. Doctors with better education would give us the patients early, while the troubles were simple, free of invasion and infection, simple operations demanded, extensive and complicated procedures rare.

All junk surgery was uncertain; it might be simple, or it might be too complicated for completion.

DISCUSSION

DR. LEWIS S. MCMURTRY, of Louisville, said that Dr. Price had called attention to one of the greatest evils prevalent at this time in relation to abdominal surgery. He alluded particularly to incomplete operations being done, and to a large number of men who were operating in the abdomen who ought not to do so without having served an apprenticeship in this work. When this association was first organized it was far more difficult for men who were not qualified to do abdominal surgery than at the present time. To illustrate: let us take any well-appointed hospital in any city in this country and it has a well-appointed operating room. There was a nurse who was well qualified to prepare patients for operation

and who understood the technique of modern aseptic surgery, and an operator who had no operative skill could put on a pair of rubber gloves that had been boiled and, if the preparation had been carried on by this competent nurse, the operator could open the abdomen of the patient, stir around in there a good deal and the patient might not die. We all knew that fifteen or twenty years ago if an operator undertook to do this kind of work, the patient would die of sepsis. He could not clean his hands, he did not have the facilities of the modern hospital, and sepsis was the result, and that soon finished his career. At the present time there were more men who were doing tyro-surgery in the abdomen than before. There were men who, without having served any apprenticeship, undertook surgical operations which Dr. Price had characterized as junk, in that they were incomplete and done by men who were not qualified to do them. Hence, patients went to surgeons with adhesions of all kinds and ptosis of the viscera and other troubles. It was the duty of members of an association like this publicly and privately to condemn men entering upon this work without having served an apprenticeship and without being properly qualified before they undertook it.

Dr. A. Vander Veer, of Albany, New York, said he always felt that there was a certain amount of risk in encouraging abdominal surgery in small hospitals, because much of the work was necessarily done by men who had not served a sufficiently long apprenticeship to do the work thoroughly and completely. Not infrequently a correct diagnosis was not made and incomplete operations were undertaken which did not reflect credit upon American abdominal surgeons. Within ten or fifteen years there had been a sort of feeling on the part of our younger surgeons to do as many operations as they could upon a particular patient. In this regard they sometimes erred. He had seen many cases that had terminated in what Dr. Price had termed surgical junk. He appreciated this paper, because it was not only timely, but it dealt with a subject to which more attention should be paid at the present time. It was the kind of paper for the younger surgeons to read carefully.

Dr. William M. Polk, of New York City, stated that the trouble with some of us was that perhaps we had been endeavoring to work out pathological problems on live subjects and in so doing we might have left conditions within the abdomen in our endeavor to preserve structures, and so forth, that really had no business there. And in so far as he had been a sinner in that direction he was free to confess that probably he deserved all the criticism that the distinguished essayist had made. He was particularly obliged to him because in his paper he opened up the whole field of surgical work. He found that the average person had been so well educated that his or her mind was made up as to what they wished their physician to do long before they interviewed them, and if he failed in any way to fall in with their preconceived notion they at once went elsewhere. He stated that we all know perfectly well that there were a great many of the younger members of the profession who had not that stiffness of spine that comes with age, that kind of ankylosis of the vertebral column which was beneficent in its influence, and which did come with age and experience. Dr. Price had very aptly said something that we could not trifle with. He had alluded to the craze for medical education. While this was not an opportunity for moralizing, yet he thought he was correct when he said we were absolutely responsible for this state of affairs. Self-righteousness would not help the situation one bit. We have simply got to get down to the first principles as to what our knowledge of the situation taught, or what was the correct thing to tell our people, whether they were patients or medical students, and when we had reached that frame of mind we would get somewhere, and we would not move one inch in the direction to which Dr. Price alluded until we made up our minds to rid our own minds of the junk that was in them.

ADHESION OF SIGMOID TO THE TUBE AND BROAD LIGAMENT AS A CAUSE OF PAIN IN SALPINGITIS

Dr. Hubert A. Royster, of Raleigh, North Carolina, stated that the Fallopian tube was the most frequent seat of inflammatory disease in the pelvis. It was the narrowest portion of the channel from the vulva to the ovary and was the least resistant to infection. Pain there was more concerned with salpingitis than with ovaritis, whether attended by a gross lesion or not. Too many times the ovary had been regarded as the offending organ, and needlessly removed. In some instances a diseased tube had been blamed as the sole cause of pain, while other factors produced by the salpingitis, or rising independently of it might be overlooked. Somewhat less than three years ago he made a clinical observation, which bears upon this question.

Mrs. S., thirty years of age, married seven years, had given birth to one child about a year before. Previous to that she had had an abortion performed on account of pernicious vomiting. Several weeks before he saw her the same pro-

cedure had been again gone through with for the same reason. For two or three years she had suffered from typical tubal dysmenorrhœa, the pain began a week before the flow and continued throughout the period. Intermenstrual pain was constant, and referred chiefly to the left iliac region; there had been several slight attacks of pelvic peritonitis. Defecation was particularly distressful. Almost every day the patient took morphin or heroin. Examination revealed extreme tenderness in either side of the pelvis, especially in the left. A diagnosis of chronic salpingitis was made. At operation, March 28, 1907, both tubes, tortuous and thickened were removed. Their removal was considered justified in view of the history. The ovaries were what are called "cystic." He removed the left and excised two-thirds of the right one. In bringing up the left tube for inspection he found that the sigmoid flexure was adherent to its fimbriated end, and also to the upper surface of the broad ligament. These adhesions were carefully divided, and the raw areas were closed by fine catgut sutures. The result was all that could have been expected. The patient immediately improved, but not until six months had passed was she really relieved. She was now entirely well, menstruating regularly without pain.

He had the records of eight similar cases in which the sigmoid adhesion was apparently the sole source of left-sided pelvic pain. He was convinced that the condition was one to be reckoned with. Its association with salpingitis or other disease of the pelvis could not, as a rule, be determined beforehand, but it might be suspected in the absence of other lesions, to account for the suffering and more especially in the presence of painful defecation. This had been a constant symptom in the instances which he had observed.

When discovered the adhesions must be dealt with as seemed proper in the given case. After snipping the bands which fix the sigmoid to the broad ligaments, there were left two triangular raw surfaces, one on the bowel and the other on the ligaments, with their bases together. These formed a diamond-shape area. The peritoneal edges were then closed over this space by a continuous catgut, applied from below upward. The sigmoid was thus allowed to drop lower down into the pelvis, away from the tube and ligament, a maneuver which, in his opinion must be executed to secure permanent relief. Covering all denuded places was not less important. In one patient who had also a chronic cystitis, cured by a vaginal cystotomy, he failed to close the raw area as well as he should, have done, and she was still, now and then, having pain on defecation, undoubtedly because of the re-forming of adhesions. This was the only case of the nine, that, so far as he knew, had not been relieved.

DISCUSSION

Dr. Henry T. Byford, of Chicago, stated that when a patient presented herself with pelvic disease he always asked her whether she had pain or not on defecation. Then he asked the question: Do you have any mucus in the stools? He thought we frequently found mucus in the stools in such cases, but not the abundant mucus which comes from a general colitis, nor the tendency to tenesmus with mucus, that comes from inflammation low down in the rectum. There was pain on defecation, particularly when these patients were at all constipated, and there was mucus in the stools. In connection with the symptoms, if the pain was in the iliac region there would be found adhesions to the sigmoid flexure. In another class of patients there was pain in the back, and no pain in the iliac region.

With regard to the size of the sigmoid flexure, these cases were apt to occur in women who were constipated a great deal, and who had a distended colon or sigmoid flexure, and the giving of laxatives and perhaps strychin and other remedies to tone up the condition of the alimentary canal, with proper diet, would be sufficient, rather than to think of any surgical procedure, in the ordinary cases.

Dr. Robert T. Morris, of New York City, stated that there was one place where the surgeon should allow adhesions to remain, namely, in his subliminal mind. There was no one thing more often overlooked in his experience than peritoneal adhesions, and their influence. Dr. Royster liked to close raw surfaces by continuous sutures. They saved time by one or two methods. The commonest one which he had used was to sprinkle aristol over the raw surface and wait until lymph accumulated and engaged the aristol in a mesh. This acted as an obstacle to further adhesion, and he had found it satisfactory in his experience on animals. The other method was to use sterilized animal membrane. That took a little longer, but in such cases as Dr. Royster had described, aristol powder would engage itself in the lymph coagulum, and present an excellent mechanical obstacle to re-adhesion.

Dr. Thomas S. Cullen, of Baltimore, stated that he had a patient at the present time who had complained for five or six years of severe constant pain in the left side. On opening the abdomen he found the uterus perfectly normal. The tubes and ovaries showed no alteration.

There was no thickening of the ureter. In making a closer examination of the sigmoid he found it adherent to the entire left broad ligament, extending as far forward as the round ligament. He adopted a procedure similar to the one described by the author of the paper, that is, freeing the adhesion as thoroughly as possible, and closing the raw surface of the broad ligament by a continuous catgut suture, and the raw surfaces of the rectum by interrupted suture, on account of which slight tearing was not so likely to occur.

DR. I. S. STONE, of Washington, D. C., stated in opening the abdomen for tubercular peritonitis and allied conditions they could never hope to separate all adhesions in such cases. It would be folly to try to do it. There were many women who had extensive adhesions, one organ being thoroughly adherent to its fellow, yet there might be no pain on defecation, or pain at any time. Where were they to stop in separating adhesions when they had such cases as that? Not long ago a woman came to him in Washington with a history of pain in the scar of a former operation. She had been operated on in Paris by an eminent surgeon; a consultation with three physicians was held. There was pain in the cicatrix and that was about all the woman could tell. The majority voted in favor of opening the abdomen to release the adhesion. When the abdomen was opened a slender adhesion of the omentum was found. The family was told that adhesions were found and separated. What else could they be told? The patient suffered precisely the same as before the operation. He found he was getting excellent results from operating upon patients and placing the bowels in the very best condition he could for continuous passage of flatus and fæces. He had separated adhesions of the sigmoid and in some cases had been astonished to find not only the greatest improvement, so far as pain and local distress were concerned, but in the general improvement of the patient, when the sigmoid had been sutured up out of the pelvis, where there should be continuous passage of flatus and gas, instead of more or less obstruction, produced by a circular folding or duplication of the sigmoid in the pelvis. Such an operation as that had given him more comfort than the mere separation of adhesions.

DR. W. P. CARR, of Washington, D. C., stated that they had all seen cases in which there were a great many adhesions and no pain, and in other cases where there was a slight adhesion with a great deal of pain. It was the situation of the adhesion and not the extent of it that caused trouble. A patient experienced great pain where there was a slight strong adhesion attached to a small area of some movable organ; whereas in the case of an extensive adhesion to a large surface the weight was sustained without any pain whatever. The most painful adhesions had been those where there was a small band pulling on some point of a movable organ. He had seen a number of such cases, and had relieved the patient by separating the adhesion not larger than a lead pencil. On the other hand, large adhesions, especially around the liver and the stomach, did not seem to produce any pain.

DR. ROYSTER, in closing the discussion, said that he was very glad Dr. Byford mentioned the discharge of mucus, because that was very important. The question then arose in such a case, was not the intestinal condition the cause of adhesion rather than the pelvic disease? Where the adhesion was due to intestinal stasis the discharge of mucus was a prominent symptom, but where it was secondary to pelvic disease, mucus was not a prominent symptom.

THE TREATMENT OF ADVANCED EXTRAUTERINE PREGNANCY

DR. REUBEN PETERSON, of Ann Arbor, Michigan, in his paper drew the following conclusions: 1. Wherever conditions permit, operation for the removal of the gestation sac is indicated in the first half of an extrauterine pregnancy since, at this period, the mother is in great danger from rupture and sepsis and the chances for the survival of the fœtus are very poor. 2. During the latter part of an extrauterine gestation the chances of rupture and a fœtal hæmorrhage are very much less (4.8 per cent) and the chances of the survival of the fœtus are very much greater. 3. While malnutrition and malformation of the extrauterine child are more common than with the fœtus under normal conditions, they are not frequent enough to contraindicate attempts at saving its life; hence, under favorable surroundings, when the patient can be watched, she should be allowed to go within two or three weeks of term before operation. 4. Since the maternal mortality is more than twice as great after operation in advanced extrauterine pregnancy where the placenta is left behind, its removal should be one of the cardinal principles of each operation. 5. In the discord variety of placenta, where only a small surface of this organ is not attached, the blood supply must be controlled either by tying the vessels, or by compression of the aorta before an attempt be made to remove the placenta. 6. When, for any reason, removal of the placenta is impossible, the sac should be switched and the placenta shut off from the

peritoneal cavity by gauze. 7. Dependent drainage through the vagina should be secured whenever possible.

THE ADVANTAGE OF NEGLECT IN APPENDICITIS OPERATIONS

DR. ROBERT T. MORRIS, of New York City, said they had conscientiously tried to do too much in appendicitis operations and had damaged patients unnecessarily. According to the principles of the pathological era in surgery they felt bound to remove all the products of infection in a most thorough way. They made elaborate arrangements for drainage, and they took the greatest care to avoid infection of the normal peritoneum. All of these things which they did with so much care and caution were commendable until they learned to step over to the principles of the fourth or physiologic era in surgery, allowing the patient to do most of the work of managing infection himself. Their function to-day was merely to turn the tide of battle, and to place the patient in such condition that he could call out his own resources and fight the battle better than they could do it for him, no matter how kind their intention, or how scientific their method that was based upon the best knowledge that they had until recently. The application of most of their resources damaged the patient in such a way that he was prevented from calling out his own good resources. If they neglected to protect the peritoneum by putting in a mass of gauze while at work, it gave the patient an advantage, because the fear of pus infecting the normal peritoneum was now known to be a fanciful fear. If they neglected to make very long incisions or multiple incisions, it gave the patient an advantage because he avoided the shock incident to large incisions, and he lost the menace of subsequent hernia. If they neglected to wash or wipe the field of operation thoroughly the patient had the advantage of avoiding the shock, and of the prolonged period of anæsthesia required for such detailed work. If they neglected to cleanse and beautify the surroundings of a post-operative fistula, the patient had the advantage of rapid closure of such a fistula through rapid contraction of connective tissue which was not meddled with.

DISCUSSION

DR. JOSEPH PRICE, of Philadelphia, stated that he wanted to condemn unqualifiedly stump operations of every character, for the reason that surgeons were too far advanced to leave one-sixth or one-eighth of the appendix when operating for appendicitis. A clean removal of the appendix was a simple procedure.

DR. W. P. CARR, of Washington, D. C., stated that Dr. Morris was certainly right in one respect, namely, that in the bad cases of appendicitis they must fit the operation to the condition of the patient. He had seen many patients recover after a simple opening had been made, and pus let out, nothing further being done except perhaps to put a catgut ligature around the appendix and remove it, if it is possible to do so at the time. Such patients would not have stood a prolonged operation.

DR. J. M. T. FINNEY, of Baltimore, wished to take exception to the word "neglect" in the title of Dr. Morris' paper, and ventured to suggest in its place the word "observance," meaning by that observance of certain fundamental principles of surgery. If there was anything that had been accepted as settled to-day it was that unnecessary handling of the tissues, or unnecessary trauma inflicted upon the intestinal organs, especially, was a surgical sin; also the unnecessary application of certain irritating antiseptic solutions to the peritoneal surface was also a surgical sin. In reference to the management of the stump of the appendix, he wanted to be considered as one of those who ligated the stump, and had always done so, and from an experience of a thousand or more cases of appendicitis, in which this had been done, he did not recall a single instance in which the slightest degree of trouble could be referred to the stump. It seemed to him they were blaming a system for the faulty application of it.

UNUSUAL TYPE OF BLADDER TUMOR

DR. ROBERT C. BRYAN, of Richmond, Virginia, in his paper reported briefly a cavernous angioma of the bladder. By suprapubic cystotomy the tumor was located with difficulty, owing to the collapsed condition of the bladder. With serrated scissors it was carefully dissected out of the mucosa, the base was thoroughly seared with the Paquelin cautery, the free edges of the mucous membrane were now stitched together with catgut, the bladder sewed to the abdominal wall, and drainage established. There was little hæmorrhage. The patient reacted well and made a good recovery. The tumor measured about three-eighths of an inch in diameter.

OBSERVATIONS UPON THE SURGERY OF THE KNEE-JOINT

DR. J. GARLAND SHERRILL, of Louisville, stated that of the major traumatisms, fracture of the patella was of chief importance. This might be a very simple injury, if, for instance, the fracture was incomplete and the fragments were not separated.

On the other hand, a compound fracture of this bone became a most serious accident. The result, after the so-called expectant treatment of fracture of this bone, might be sufficiently good to insure fair functional use of the limb. The results of the open operative treatment, however, were so much better that in healthy young patients and under proper surroundings the open method was strongly to be advised.

His plan of treatment in fracture of the patella consisted in a semilunar incision across the front of the joint at, or just below, the site of the fracture. Any clots of blood present were removed and all bleeding vessels controlled. A lacerated tendon of the quadriceps muscle was then sutured on each side and over the patella with a chromic catgut. The fascia and skin were then closed with catgut without drainage. After the wound was dressed the limb was placed in plaster of Paris. Passive motion was advisable in the third week, and the patient could walk upon the limb before the end of the fourth week. The fractures of the femur and tibia were always the accompaniment of very severe violence and ought to be treated according to the general principles for use in such injuries.

He recorded a case in which first one and then the other patella was dislocated as a result of trauma, with a persistence of dislocation in each case. The operation for its relief consisted of an incision on the inner side of each knee through the quadriceps tendon, and the edges of this muscle were overlapped so as to shorten the attachment of the patella on the inner side, according to the method described by F. E. Bunts.

Dislocation of the semilunar cartilage proved very troublesome to the patient and frequently caused great pain as well as fixation of the joint. The internal cartilage was affected more frequently than the external and the dislocation might be partial as a folding of the cartilage upon itself, or the entire cartilage might be separated. The causative factor was in most cases a sudden torsion of the tibia, although a blow driving the tibia backward in moderate flexion might produce it. The diagnosis was to be made by the sudden fixation of a previously healthy joint accompanied by a sharp pain with subsequent restoration of function, and later a recurrence of the symptoms. Effusion into the joint might follow the injury and in some cases the cartilage might be felt in front of the joint near the margin of the tibia. Pressure over its former attachment would elicit pain and soreness. The latter was a valuable point in the diagnosis of this condition from loose (extraneous) bodies in the joints. Treatment for this condition was either palliative or operative.

The following taken from his case book was a fairly illustrative case of this condition: E. C., white, 47 years of age, was referred to him with the history of a blow upon the right knee thirty-three years ago from the kick of a horse, which the patient thought caused a separation of a fragment from the head of the tibia. Three years ago the joint began to trouble him considerably. He had felt a large floating body for a long time, and recently could feel another. The joint was swollen and locomotion impaired.

Marked synovial swelling and extension of the sac with two movable bodies were readily felt above the patella. An incision two inches long was made over the outer part of the synovial pouch through the quadriceps parallel to its fibers and two bodies were removed. The first was large, concave on its under surface, convex on its upper; about two inches in its widest part. It was unevenly rounded and presented marked irregularity of surface, with pits underneath, and rounded prominences on its upper surface and edges. These prominences were smooth and covered with glistening white firm material like cartilage. The color of the whole piece was white except near the point of attachment by a single pedicle to the synovial fringe. For a space the size of a quarter it was reddish purple in color.

The smaller body was the size of a hazel-nut and presented the same rounded irregularities; it was white in color and quite firm. A quantity of thick synovial fluid escaped when the sac was opened. The wound was sutured in three layers, several layers of gauze applied to the knee, and bandaged. Over this a voluminous layer of cotton was applied and a very snug roller. Healing took place in five days with the joint normal size. No evidence of tuberculosis. A portion of the tissue from the joint and some of the synovial fluid was examined by Dr. John E. Hays, who reported that the tissue was granulation tissue, non-tubercular. The fluid taken from the cavity was sterile. No growth on media after 48 hours.

DISCUSSION

Dr. A. R. Shands, of Washington, D. C., said he had no more hesitation in opening the knee-joint than he would have in opening the abdomen, and he had been doing it right along in cases of obstinate synovitis. In many cases of recurrent synovitis the joint had never been emptied of synovial fluid. The accumulated synovial fluid formed a mass similar to that in the bottom of an old vinegar barrel, and that was what caused recurrence of the trouble.

Dr. W. O. Roberts, of Louisville, said he agreed

with Dr. Sherrill relative to the treatment of fractures of the patella, in that he had long since given up the use of metal appliances for holding the fragments together. He resorted to the open method in the treatment of these cases where they had the advantage of a suitable infirmary. He had seen but two cases of dislocation of the patella.

Dr. Horace J. Whitacre, of Cincinnati, said he wished to report two cases of loose semilunar cartilage, one in a boy ten years of age, in which the cartilage was organized and was removed; the other in a patient in whom the cartilage seemed to be in fairly good shape, and was sutured in place. The boy remained in good condition except that he had had some pain from time to time when he exerted himself, but he had had no further displacement.

Dr. John C. Wysor, of Clifton Forge, Virginia, recalled one case in which he found fifteen floating bodies in the knee-joint, which ranged in size from the size of the end of his little finger to more than an inch in diameter. Operation was followed by a good result.

The paper was further discussed by Dr. Stephen H. Watts, Charlottesville, Virginia, and Dr. Randolph Winslow, Baltimore.

MYOSITIS OSSIFICANS TRAUMATICA

Dr. J. M. T. Finney, of Baltimore, stated that the pathological condition which formed the basis of his paper was one, the existence of which had been recognized for a long time, but only within a comparatively few years had it attracted any general attention. Including the seven cases reported in the paper, over 150 cases now have been so far recorded. There was always danger of mistaking this disease for sarcoma. Three of his cases came to him with a provisional diagnosis of sarcoma of the femur. There still existed a considerable difference of opinion as to the manner in which these bony deposits took place, and the source from which they came. He called attention to a number of distinct conditions which had been grouped under the general head of "Myositis Ossificans." These all represented different pathological processes.

The factor most concerned in the production of this trouble was unquestionably a single severe trauma, as, for instance, a kick by a horse. Nearly one-half of all the cases were observed in the front of the thigh, involving the quadriceps extensor muscle. This and the flexor muscles of the arm seemed to be the most common sites. The symptomatology was, as a rule, quite characteristic. Following a severe trauma there might be noticed the usual clinical phenomena, namely, localized swelling, tenderness, ecchymosis, and disturbance of function.

Dr. Finney discussed the diagnosis, differential diagnosis, and prognosis. The ultimate prognosis was good. So far as the individual operation was concerned, it depended largely upon the stage in which it was performed. There was always the tendency to recur in those cases operated upon early during the period of activity of the osteoid tissue. Later cases did not tend to recur, that is, those in which growth of bone had ceased. The pathology of the condition had given rise to a great deal of discussion, and it was yet not definitely determined.

As prophylactic measures, aspiration, and pressure were of somewhat doubtful efficacy, although highly recommended. Early incision with the evacuation of effused blood, the thorough removal of small fragments and spicula of bone, with drainage of the affected area may, in some instances, prevent the formation of the trouble. Massage in the early stages was contraindicated, as it might affect unfavorably the development of the trouble by stimulating the production of bone. The indications for operation were the presence of the tumor, the disturbance of function, pain, etc.

CHOLECYSTENTEROSTOMY IN CERTAIN CASES OF PANCREATITIS

Dr. Le Grand Guerry, of Columbia, S. C., made a plea for the more general use of this operation in this disease. He related a case which was typical of quite a number to serve as a concrete illustration.

Mr. M., aged 38, married, several years ago had an attack of pain in the gall-bladder region with very slight jaundice, pain occasionally radiating under the right shoulder, slight fever, indigestion, etc. These attacks occurred at infrequent intervals, but there was a gradual weakening and loss of flesh. There was no sugar in the urine. A diagnosis of gall-stones or pancreatitis or both was made and at the operation a slightly distended gall-bladder, with no stones, was found. The bladder was full of the characteristic ropy, tarry, black bile and a well-marked colon bacilli odor to it. The pancreatic head was markedly enlarged. Operation consisted in cholecystotomy after the common duct had been thoroughly explored and a probe passed into the duodenum to insure the patency of the choledochus. Drainage was continued for three months, during which time the patient gained twenty pounds in weight and was completely restored to health. Later patient had another attack, at which time cholecystenterostomy was done with the result that he had been

permanently relieved from all of his symptoms and was now in perfect health.

PANCREATIC HÆMORRHAGE AND ACUTE PANCREATITIS

Dr. JOSEPH RANSOHOFF, of Cincinnati, in his paper reported three cases, two of the former and one of the latter. They were all of the ultra-acute type. In two of the cases the hæmorrhage into the free peritoneal cavity was very extensive, so that one might have thought of the rupture of one of the large vascular viscera or of a large mesenteric vein. In the third case the fluid was only tinged with blood. In two of the cases, where the hæmorrhage was very severe, no fat necrosis was seen at the time of operation. In the third a fat necrosis led to the diagnosis during the operation. One of the acute cases with severe hæmorrhage recovered after laparatomy with drainage and gauze packing. In one of the fatal cases, fat necrosis was not seen at the time of the operation nor after autopsy was made. In none of the cases was a diagnosis made. In one it was thought of on account of the slight jaundice which was present. In the critical part of the paper the time for operation and the method of procedure were considered. While, as in phlegmonous conditions elsewhere, it would seem necessary that the lesion of the pancreas should be attacked in every case from an academic viewpoint, it was not practicable in all cases. The condition of the patient was often so desperate, that a prolonged search for the lesion would be fatal, while drainage and gauze packing properly placed would give the patient a chance for recovery. Statistics with great preponderance showed the value of attacking the pancreas in a formal way as part of the operative interference as compared with drainage alone. Statistics, however, could have little value in determining the procedure to be adopted when one considered the great variation which existed in the symptoms at the time an operation was performed. Each case must be considered on its own merits and the operator must know to what extent operative interference beyond drainage and walling off the focus of the disease with tampons the patient would tolerate. No fixed or fast rules should be laid down. In regard to chronic pancreatitis he objected to the offhand way in which a diagnosis was often made at an operation by the sense of touch alone and regardless of the existence of the well-known clinical evidence of chronic pancreatic disease.

PANCREATO-ENTEROSTOMY

DR. R. C. COFFEY, of Portland, Oregon, stated that the drawback to the development of pancreatic surgery had been that during embryological development the pancreas had been rotated out of the peritoneum. The peritoneum produced an exudate when injured which served the same purpose as callus after a fracture. The fat-splitting ferment of pancreatic juice did not readily penetrate peritoneum, but was serious when spilled in the retroperitoneal areolar fat spaces or between the layers of the mesentery or omentum.

The problem to be solved in direct pancreatic surgery was to supply peritoneum to the operative field. This was best obtained from the outer coat of the intestine by inversion. The lumen of a single intestine was too small. Therefore, it had been necessary to throw the two lumina of an intestinal loop into one which, after inversion, gave an ample peritoneal canal into which the cut end of the pancreas was implanted. Using this method the following classes of operations were done:

The tail of the dog's pancreas was cut in two and each cut end implanted into a separate loop of jejunum. Of four specimens recovered, each showed perfect union between pancreas and intestine; but no pancreatitis nor necrosis. In isolating the tail of the pancreas the pancreatic duct was found patent and delivered into the intestine. The connected end of the pancreatic duct was closed by a thin tough film, the juice all going through the duct of Wirsung. The same thing occurred where the duct was ligated by a linen ligature but not cut, for the ligature was circumvented in all cases, and the juice was freely delivered back into the duodenum through the duct which was established around the ligature. By ligating and cutting both ducts of Wirsung and Santorini and interposing omentum, and implanting the cut end of the tail, the juice of the other tail and body was freely delivered into the loop of jejunum through the implanted tail and its duct maintained. Second, the head of the pancreas and one tail and the duodenum were successfully removed in two stages. *First*, the bile duct was transplanted to intestine lower down, a gastroenterostomy done with excision of pylorus. *Second*, two weeks later we removed the body and one tail of the pancreas and section of duodenum, and implanted the remaining tail into the jejunal loop. The results were the same as in the previous cases. In all five cases the specimen showed enormous dilation of the common and hepatic ducts, and in one instance the bile duct was almost as large as the duodenum and almost as thick. The communication with the intestine was free enough to admit the end of the little finger, the distention evidently being due to intraintestinal pressure; therefore, an indirect method was

devised, which consisted of running the duct immediately under the mucous membrane for an inch before bringing it inside. The results in the three specimens removed, two of which were of two months' standing, showed that a perfect valve had been formed and no dilatation had occurred, the ducts being entirely normal in size and thickness.

Encouraged by these results the writer was now conducting a series of experiments in which the ureter was implanted into the large intestine in the same manner with the hope of preventing ascending infection here. Direct implantation of the stripped pancreatic duct was tried in six cases. While one dog lived to be killed on the 24th day and was in good health, it was found that the duct connected with the intestinal lumen only by a fistula. Four of this group of dogs died before the sixth day, showing pancreatic necrosis. One died on the tenth day. One fact stood out in all the six cases, namely, the pancreatic duct died as soon as it left the pancreas, thus leaving the inference that the pancreatic duct probably received most of its nutrition from adjacent pancreatic substance, and would not bridge the chasm between the gland and intestine, as was done in the case of the bile duct and ureter.

DISCUSSION

DR. JOSEPH C. BLOODGOOD, of Baltimore, stated that the cause of death in acute hæmorrhagic pancreatitis had been said to be due to trypsin and perhaps other ferments free in the peritoneal cavity, and present in the blood, and these ferments produced disseminated fat necroses. If one could make a diagnosis of acute pancreatitis the abdomen should be opened and the fluid allowed to flow out and the region of the pancreas drained to prevent further intoxication with these ferments. The question of the operative treatment of acute hæmorrhagic pancreatitis was settled, and that was, evacuation of the peritoneal exudate and drainage of the pancreas.

DR. STEPHEN H. WATTS, of Charlottesville, Virginia, stated that during the present year he had had three cases of acute pancreatitis, one of them of the subacute variety. One of the most interesting things in these cases was the presence of hæmorrhage in acute pancreatitis, and it was a question in his mind as to the relation of this hæmorrhage, whether it preceded infection, or pancreatitis, or whether it followed it. Dr. Ransohoff had not found infection in his early cases, as the cultures had been negative. It looked as if in many of these cases there was an arteriosclerosis which might give rise to the first hæmorrhage, and that the blood subsequently became invaded through the intestine or biliary tracts.

DR. ROSWELL PARK, of Buffalo, stated that at the time President McKinley was shot we did not know much about the surgery of the pancreas, and when seeking an explanation for the peculiar necroses which were found in his case, he suggested that in all probability the wound of the pancreas had to do with the subsequent course of events. He really believed that this wound of the pancreas had much to do with it. He believed that unfortunate instance directed surgical attention to the surgery of the pancreas in a way which it would not have done had not that sad event happened.

DR. CHAS. H. MAYO, of Rochester, Minnesota, said he was struck with what Dr. Guerry had said with reference to cholecystenterostomy. No doubt this operation should be more frequently done. If there was jaundice present, with hardening of the pancreas, and no gall-stones, then we should at once think of the advisability of doing this operation. The question of doing it in simple inflammatory conditions, such as cholecystitis, was something for the future to decide. But these were not the gall-bladders that they would remove to-day, but they were the ones that led to further operation.

DR. H. A. ROYSTER, of Raleigh, North Carolina, stated that two months ago a man, 70 years old, came in with a typical history of gall-stones. He had had jaundice only once, and that had disappeared entirely. Examination of his urine three days before operation showed a well-marked reaction to sugar. They opened his gall-bladder, removed one hundred and eighty gall-stones, and drained in the usual manner. The head of the pancreas was enlarged. One week after the operation the sugar disappeared entirely from the urine, and had not returned.

DR. WALTER C. G. KIRCHNER, of St. Louis, stated that of five cases of pancreatitis he had met with three which were of the suppurative type and resulted fatally. In two of these cases a diagnosis was made, but the conditions were so fulminating that operative procedure did not seem to be indicated, or by the time the patient reached the hospital his condition did not warrant operation. In one case in which a pathological diagnosis was made of hæmorrhagic pancreatitis, there was no hæmorrhage in the abdominal cavity, but the pancreas itself was involved. This patient gave all the acute symptoms of pancreatitis, and at the autopsy an ulcer of the duodenum was found, which had a direct communication with the head of the pancreas.

DR. GEORGE W. CRILE, of Cleveland, stated that in making cultures from the gall-bladder in these cases of chronic infection or chronic pancreatitis, he had seen much better results from the use of autogenous vaccines than from drainage alone, that is, following the use of autogenous vaccine *plus* the drainage. Furthermore, large doses of urotropin for a certain period of time were of value. Again, in cases of acute hæmorrhagic pancreatitis he called attention to the value of nitrous oxide anæsthesia.

DR. JOHN C. MUNRO, of Boston, stated that the paper of Dr. Guerry reminded him of a case in which he did a cholecystenterostomy six or eight years ago for a lesion at the ampulla, but which proved to be a case of chronic pancreatitis. A diagnosis now could undoubtedly be made both in the chronic and in the acute forms of pancreatitis in a fair number of cases. He had had quite a number of acute cases of pancreatitis, and in a fair proportion of them had been able to make an accurate diagnosis before operation. The type of jaundice both in the acute and chronic forms was rather significant, although it was not an absolute sign on which to depend. He favored operating upon very acute cases.

DR. O. H. ELBRECHT, of St. Louis, said he would like to report briefly a case which differed somewhat from those mentioned. It was a case of chronic pancreatitis, the patient coming from an insane asylum, presenting the picture of an acute gall-stone attack, with profound icterus. The pain was severe. The case was diagnosed as gall-stones, with probably the escape of the gall-stone through the intestinal wall. A definite lump could be felt in that region, and they found dense adhesions everywhere, and an immensely distended gall-bladder. The gall-bladder was drained. As the patient was in a bad condition they did not care to explore the region of the pancreas, as it was not suspected at the time. The patient died the next day, and autopsy revealed the case to be one of primary tuberculosis of the pancreas. Sections were made from an ulceration at the tip of the pancreas and found to contain innumerable tubercle bacilli.

FREQUENCY OF CANCER

DR. ROSWELL PARK, of Buffalo, stated that cancer was one of the most important problems which confronted the medical profession to-day. He believed cancer was on the increase as a disease of modern life. When he began work in this direction there were in New York State fourteen thousand deaths from tuberculosis each year, and about five thousand deaths in cases of cancer. Now the mortality from tuberculosis had been reduced to eleven or twelve thousand cases a year, while the mortality from cancer had risen to nearly eight thousand. Their studies had established the fact that cancer was prevalent in certain localities and in certain houses. They found there were certain places where cancer was more prevalent than in others, and in a considerable number of houses several deaths from cancer had taken place. With regard to heredity, it was now stated as a fact that the disease was not transmitted by inheritance, but there was a possibility of the transmission of predisposition. This was a very important question for the laity and for us. The infectivity of cancer was quite generally established. Last year, at the meeting of the International Congress of Surgeons in Brussels, the question of cancer was discussed for three separate days, and of some three hundred who were present out of a membership of six hundred, he found the majority of surgeons present believed in the infectivity of cancer. There were still some doubters of this theory. The very fact that metastases occur during cancer was the best demonstration of its infectivity, and for him every instance of metastasis in a given case was an expression of a reinfection from the original source. As to the contagiousness of cancer, they had far more proof for its contagiousness than leprosy, or some other diseases that were considered more or less contagious. The early diagnosis of cancer was difficult, and in many instances impossible. Cancer had no definite symptomatology. If cancer could be early diagnosed or recognized, and if it were accessible to their present means of attack, and if it were thoroughly removed it could be cured, but there were "ifs" standing up in tremendous proportion, and they were insuperable apparently.

SUTURE OF THE RECURRENT LARYNGEAL NERVE, WITH REPORT OF A CASE

DR. J. SHELTON HORSLEY, of Richmond, Virginia, stated that after a thorough search of the literature, he had been unable to find a report of any case in which the recurrent laryngeal nerve was sutured. There had been considerable experimental work done, chiefly by those interested in veterinary surgery, in which the left recurrent laryngeal was divided, and implanted higher up in the vagus. Most of these experiments had resulted successfully, so far as restoring the function of the laryngeal muscles supplied by the left recurrent nerve was concerned. He reported a case in which the left recurrent was injured by a bullet wound. The case was referred to him about three months after the injury. The patient was

examined by a laryngologist, and all of the muscles supplied by the left recurrent laryngeal were found completely paralyzed. An incision was made along the anterior border of the sterno-cleido-mastoid muscle and the injured nerve was easily found in the groove between the œsophagus and trachea. The diseased portion was excised, except a small filament consisting of the posterior part of the nerve sheath. The ends of the nerve were brought together with a single suture of No. O chromic catgut in a fine curved needle. Some muscle tissue was drawn over the sutured nerve. The wound healed by first intention and the patient left the hospital nine days after the operation with no improvement in voice or in breathing at this time. The improvement was gradual, however, and two reports from a larynogologist were made after the operation. The first about two months after operation showed improvement in the muscles and the second report, fifteen months after the operation, stated the laryngeal nerve had fully recovered. The case was apparently unique.

TREATMENT OF WOUNDS OF THE HEART, WITH REPORT OF TWO CASES

DR. WALTER C. G. KIRCHNER, of St. Louis, in reviewing the subject of injuries of the heart stated that he wished to say that at the St. Louis City Hospital there had been five cases of cardiorrhaphy with three recoveries. He reported two of his own cases, one patient died four hours after the operation, and the other made a successful recovery. In the first case there were two wounds of the ventricles, and in the second there was a wound of the heart, one and three-fourths inches in length, which penetrated the left ventricle. The symptoms and treatment of injuries to the heart were outlined. He laid special stress on the method of approach to the heart of these injuries. He considered all wounds of the heart as serious, and gave the following conclusions: "The heart may be manipulated without serious injury to the organ and is amenable to surgical interference. Hæmopericardium with heart tamponade is a serious complication and demands prompt drainage of the pericardial sac. In suspected injuries to the heart, the wound in the chest should be carefully explored so that the extent of the injury may be determined, and in cases of doubt, exploratory pericardiotomy is indicated. Small wounds of the heart may heal spontaneously, but in all cases where hæmorrhage from the heart exists, the wound should be promptly sutured. In operations upon the heart, when pulsations suddenly cease, massage of the heart and artificial respiration should be tried as aids in resuscitation. With a minimum amount of anæsthetic the healthy lung is capable of performing its function, though to a less extent, even when the pleural cavity is exposed. Time is an important factor in injuries to the heart, and an early diagnosis should always be made. The immediate treatment should be directed to the control of hæmorrhage and shock. The chief remote complications result from infections of the pericardium and pleura. In treating injuries to the heart, the surgeon should have in mind a definite plan of attack, and the kind of flap to be used in approaching the heart should be determined by the nature of the wound in the chest."

CIRCUMSCRIBED SEROUS MENINGITIS OF THE CORD

DR. JOHN C. MUNRO, of Boston. This paper will appear in a later issue of Surgery, Gynecology and Obstetrics.

ABDOMINAL CÆSAREAN SECTION FOR PUERPERAL ECLAMPSIA

DR. LANE MULLALLY, of Charleston, South Carolina, in his paper reported four cases of puerperal eclampsia. The first two cases were brought into the hospital with the usual history of eclampsia, each having had convulsions for about six hours before being admitted. The first case was delivered under anæsthesia by dilatation, instrumental and manual and high forceps, and the second by similar dilatation and version, each case occupying from one to two hours. In the first case convulsions continued for twelve hours, when the patient died. The second case had several convulsions after delivery and recovered. The third case was a multipara with considerable scar tissue in the cervix, was anæsthetized, and an hour or more uselessly spent in attempted dilatation. Finding it impossible to dilate the cervix, he determined upon abdominal Cæsarean section, preferring this to vaginal Cæsarean section, and delivered the child in seven minutes. The whole operation when completed occupied twenty-seven minutes. The case was a six months' pregnancy, and the child was dead when delivered; in fact, the child was dead before the operation was begun. In the fourth case of full term pregnancy the woman had convulsions every fifteen minutes. In this case he did an abdominal Cæsarean section at once, delivered the child in six minutes, closed the wound, and the patient was returned to the ward in twenty-six minutes from the time operation began.

Recently abdominal Cæsarean section with the perfect technique of the present day had materially lowered the maternal mortality, and the operation

was selected not only on this account, but also for the reason that it offered better advantages in saving the life of the child than many of the intrapelvic methods of delivery. The operation was far less dangerous than high forceps version and he believed, vaginal Cæsarean section. Granting rapid evacuation to be the rational treatment, he contended that it was best accomplished by abdominal Cæsarean section.

PRESIDENT'S ADDRESS: LATENT AND ACTIVE NEURASTHENIA IN ITS RELATION TO SURGERY

DR. STUART MCGUIRE, of Richmond, Virginia, emphasized the importance of refusing to operate on a neurasthenic patient unless the symptoms could be plainly shown to be due to organic disease, and he impressed the necessity, if an operation was undertaken on a patient with either latent or developed neurasthenia, of protecting the nervous system from physical or psychical shock, not only by a proper preliminary preparation, but by careful and often prolonged post-operative and post-hospital treatment. If neuroses existed without anatomical disease, an operation would do no good and might result in harm. If neuroses were found coincident with pathological lesions, an operation might prove of great benefit, but in relieving the physical disease care should be taken to avoid increasing the nervous disorder. If neuroses were present, reflex in character and due to remedial causes, an operation might be undertaken with assurance of complete success. In other words, surgeons should divide these cases into three classes: The first to be avoided, the second to be undertaken with caution, and the third to be cheerfully given the relief to which they were entitled.

In discussing the management of neurasthenic patients requiring surgical intervention, he divided the subject into the preliminary examination, the preparation for the operation, the post-operative and the post-hospital treatment. He pointed out the necessity of certain patients remaining for some time at the hospital, and taking a modified form of rest cure, and impressed the point by contrasting the conditions of hospital and home life. The surgeon usually attempted to direct the treatment of patients after they returned home by giving them verbal instructions when they left the hospital, and by subsequently corresponding with them, but the end desired could be more effectively and properly secured by referring the patients back to the family physician. With the rapidly increasing amount of surgery and the consequent number of convalescing patients requiring treatment, an educational move ought to be instituted for the study of the many peculiar factors involved. When surgeons appreciated the influence of neurasthenia on the results of an operation, and the influence of an operation on the production of neurasthenia, when the family physician was educated in the many details of post-hospital treatment, and was given legitimate work with proper compensation, then, and not until then, would there be harmony in the profession, and the greatest good accomplished to the greatest number of patients.

THE DIAGNOSIS OF HYPERTHYROIDISM OR EXOPHTHALMIC GOITER

DR. CHARLES H. MAYO, of Rochester, Minnesota, stated that an effort had been maintained to consider hyperthyroidism a finished product, to be diagnosed as such only within the narrow limits of the imperfect descriptions of the few cases, described by Parry, Graves, and Basedow nearly a century ago. It was not considered that the thyroid played a more important part than the heart or nervous system. Many marked cases failed in some particular and were classed as fruste or pseudo until the lacking symptom appeared. There was a present tendency to drop some of the old classifications and acknowledge that there were various stages: acute, chronic, mild, severe, and irregular forms based upon an increase, probably with some changes of secretion and its delivery. The laboratory findings should show an increase in parenchyma; (a) more cells in the alveoli; (b) more alveoli; (c) papillomatous increase of cells in existing colloid goiter. These changes might be general or in scattered areas. Terminal degeneration of essential organs followed degeneration of the gland in the advanced cases. In this stage the patient might be improved and the disease checked, but not cured, by operation. Forms of myxedema were not uncommon in patients who had survived the hyperthyroidism until degeneration destroyed the major portion of the gland. Eye symptoms and heart signs must be differentiated from chronic Bright's disease, and from myocardial changes. Leukemia of the neutrophilic polymorphonuclears and the percentage and absolute increase in the lymphocytes, should be looked for as diagnostic laboratory aids of some importance. An early diagnosis had become more important since surgery invaded this field than when it was purely medical, in order that a prognosis of the probable result of an operation could be given. In some cases this might mean before eye changes appeared, and in others, before the goiter became a prominent feature.

AN EXPERIMENTAL AND CLINICAL RESEARCH INTO NITROUS OXIDE AND ETHER ANÆSTHESIA

DR. GEORGE W. CRILE, of Cleveland, Ohio, stated in his service they had given nitrous oxide 575 times for major operations. Among these were included many of the hazardous risks in which ether was contraindicated. Comparing the nitrous oxide cases with ether cases nausea occurred in 17 per cent as compared with 42 per cent in ether. This included all cases. Post-operative nausea was, of course, not wholly due to the anæsthesic, i. e., peritonitis and certain visceral operative trauma might independently of the anæsthetic cause nausea. Nausea in nitrous oxide cases in which there was no other nausea producing factor rarely occurred. In the course of the operation, nausea, in nitrous oxide, as in ether, was usually due to uneven administration. At the conclusion of the operation the patient was fully awake and in unclouded possession of all his faculties in two or three minutes. There was unmistakably a great diminution in surgical shock. Indeed, the immunity from shock was as striking in the clinic as in the laboratory.

He was well aware that the shock in the routine cases, free from predisposing complications was rare; but in the cases most urgently demanding surgical relief, such predisposing causes were present, and frequently constituted the principal factor of the immediate risk. It was here that nitrous oxide appeared at its best. Then, too, in infections, since using nitrous oxide as contrasted with ether, they were equally certain that ether as compared with nitrous oxide impaired the immunity of the patient. The difference was so striking that only a great emergency would now induce them to use ether instead of nitrous oxide in grave infections.

In a parallel series of acute infections, consisting of 75 cases operated upon nitrous oxide and 75 under ether, the technique and the after treatment being constant factors, careful records were kept at the time of the operation and in bedside notes. The average pulse observation was here presented. At the time of operation the average pulse of the ether cases was 114; and the average of all the pulse observations during the first 24 hours following operation was 117, while in nitrous oxide the average pulse rate at the time of operation was 115; the average of all the counts during the first 24 hours following operation was 105. In ether there was an average increase of 8 beats; in nitrous oxide there was a decrease of 10 beats. In every other respect also the patient showed a more distinctly favorable course after nitrous oxide than after ether. Not a case showed the rapid march to fatality immediately following the operation as occasionally followed ether.

Nitrous oxide as compared with other general anæsthetics was technically difficult and expensive. It had certain dangers, which were almost wholly in the control of the skilled anæsthetist; it was not the anæsthetic of choice for the uninitiated, but only for the highly trained anæsthetist. Properly supplemented and skillfully given, it might be used as a routine anæsthetic in general surgery. Once the operation was over the patient was strikingly better off than after ether anæsthesia. The role of shock and infection was far less in nitrous oxide than in ether anæsthesia, and accumulating evidence seemed to show that there was a distinct diminution in post-operative neurasthenia.

In routine operations the combination of scopolamin and morphine given one and one-half to two hours prior to nitrous oxide anæsthesia formed so effective a combination that in over 50 per cent of his patients the day of operation was robbed of all operative memory, and in the remainder it dulled the edge of both the physical and the mental distress.

GALL-STONES WITH REFERENCE TO CANCER OF THE GALL-BLADDER

DR. ALBERT VANDER VEER, of Albany, New York, detailed his observations on this subject. Of seventy-seven cases not previously reported, there were nineteen males and fifty-eight females, illustrating the fact that females suffered more than males from gall-bladder complications. The diagnosis before operation of the seventy-seven cases was as follows: Gall-stones, 64 cases, cholecystitis, 10 cases, and gall-stones and carcinoma, 3 cases. Operation revealed a variety of conditions, all of which were given in tabular form. A study of the mortality list impressed the author with the statement that had been made by other operators that stones in the common duct of long standing were very difficult to reach, and the percentage of deaths was much greater here than in simple cholecystotomy, where there were no such complications. The mortality in the latter cases was very small. One case of the group illustrated most forcibly that marked cholemia was not always fatal after an operation.

The experience of surgeons throughout the world during the past ten years indicated that early diagnosis was of the greatest importance to the affected individual. In this connection the author quoted Drs. W. J. Mayo and Charles H. Mayo as follows: "In reviewing the mortality of 1,000 operations for gall-stone disease we have

been impressed with the very fortunate outcome where gall-stones were in the gall-bladder and therefore were complications. In the 1,000 cases there were 50 deaths, or an average mortality of five per cent. The death rate in 820 cases where the disease was confined to the gall-bladder and for benign conditions was three per cent. In 416 cases of simple gall-stone disease the mortality was less than ½ of one per cent. The common duct operations amounted to 14.6 per cent of the whole. In 137 operations for common duct stones the mortality was 11 per cent. In 40 cases, or 4 per cent, malignant disease was discovered, and the operative mortality was 22 per cent. In practically all of these cases gall-stone irritation had been the cause of the development of cancer."

SOME THERAPEUTIC ADAPTATIONS OF CECOSTOMY AND APPENDICOSTOMY

DR. CHARLES A. L. REED, of Cincinnati, Ohio, stated that these operations, now being done largely at the instance of medical men as adjuncts to their treatment of certain otherwise intractable cases, were based upon the principle that disease within the colon called for treatment addressed to the colon. The advantages of this method of access embraced (*a*) exemption of the stomach for medication, (*b*) escape from impairment of the general health from deranged digestion incident to medication, and (*c*) relief from the uncertainty of remedies that had been subjected to indefinite and undeterminable chemical reaction in the upper digestive tract. The anatomy of the parts pointed to cecostomy rather than appendicostomy as the operation of choice. Among the conditions for which ostiomatic operations on the cæcum were now being successfully employed were: (1) amæbic dysentery, in which it opened the way to treatment more phenomenally successful than had heretofore been realized in the history of this malady; (2) chronic catarrhal or mucous colitis, usually very intractable but which, as shown by his own cases, were cured by this method more promptly and in larger percentage than by other treatment; (3) chronic constipation depending upon atony and not complicated with enteroptosis was readily brought under control, as indicated by his own reports confirmed by those of other surgeons; (4) acute septic peritonitis in which, after operation, the cæcum was opened and utilized to flush the colon — "a hot water bottle on the inside" — followed by saline infusion by the drop method — the "coloclysis" of the author, with a record of uniform success in the cases in which he had applied it; (5) defective flora of the colon was remedied by the installation through the cæcal tube of bacilli chiefly of the lactic acid series; (6) autointoxication of intestinal origin was successfully treated by repeated flushings of the colon through the cæcum, the cases recorded embracing cures by this method in chronic headaches, idiopathic epilepsy, rheumatoid arthritis, and pernicious anæmia. The recorded experience of his own and that of other surgeons forced the conclusion that: *First*, the establishment of colonic irrigation through the cæcum, whether by cecostomy or appendicostomy, was a procedure attended with the minimum of surgical risk; *second*, the application of the operation as an adjunct of medical practice was based on the principle of direct treatment of the colon for conditions that were local to the colon; *third*, the results so far realized justified the continued use of the operation and the more extended application of the principle that it embodied.

SUCCESSFUL ENUCLEATION OF A MENINGEAL ENDOTHELIOMA INVOLVING THE MOTOR CORTEX

DR. STEPHEN H. WATTS, of Charlottesville, Virginia, stated that with better powers of diagnosis and better operative methods the number of successful cases of extirpation of brain tumors was constantly increasing, nevertheless they were still of sufficient rarity to justify the reporting of individual cases.

The meningeal tumors were of special interest, since they represented the most favorable cases of surgical treatment. This was due to the fact that they were usually benign, were well encapsulated, grew slowly, and, owing to their superficial situation, were apt to give rise to localizing symptoms.

The following case was one of meningeal endothelioma, a type of tumor which was especially prone to occur in the cerebellopontine region, though here it involved a motor cortex.

Mrs. S. K., aged 33, housewife, was admitted to the University of Virginia Hospital, September 27, 1909, complaining of headache, vomiting, and dimness of vision. Her family history and previous history were unimportant. The present illness began two years ago with convulsions which she described as beginning in the right corner of the mouth, passing to the right arm and then to the right leg, when she would become unconscious. Had had almost constant severe headache which was worse on the left side of the head. Frequent spells of vomiting. Gradual failure of eye sight. Weakness of right arm and left first noticed three or four months ago.

Examination. Sight impaired, but she could count figures held in front of her. Marked choking of both optic discs. There was definite motor

aphasia. Partial paralysis of right side of face and right arm, the muscles of the latter being somewhat atrophied. There was little, if any, sensory disturbance. These symptoms and signs seemed to point to a tumor in the lower portion of the left precentral gyrus.

Operation. October 5, 1909. An encapsulated tumor 3 by 4 cm. in diameter, which proved on microscopical examination to be a meningeal endothelioma involving the arm and face areas of the left motor cortex, was removed. The patient made an excellent recovery from the operation. There was no return of the headache or vomiting and when she was discharged on December 1, 1909, the paralysis of the face and arm had almost entirely cleared up. The most disappointing feature of the case was that the sight improved little, if at all; atrophy followed the choking of the discs. This illustrated the importance of earlier operation in such cases.

INCISIONS TO EXPOSE AND OPEN THE KIDNEY

DR. HOWARD A. KELLY, Baltimore, Md., pointed out the almost universal abandonment of transperitoneal incisions in approaching the kidney and called attention to the vagueness of view in reference to the lumbar incisions. This vagueness or lack of certainty as to the incision was due to the kidney's situation high up under the ribs and close to the diaphragm. The type of incision must vary with the nature of the kidney affection. In simple conditions, such as movable kidney and hydronephrosis, the kidney could readily be luxated; therefore, there was not the same necessity for getting down immediately on the pedicle as there was in dealing with malignant tumors. The author particularly called attention to an important anatomical landmark, the *superior lumbar triangle* and noted that it had been neglected by the anatomists and surgeons. He proposed it as a splendid starting point for all kidney incisions to expose a movable kidney, cutting down on the superior lumbar triangle and pulling the muscles apart with blunt force sufficed. This simple incision which could be the beginning of all incisions could be lengthened by cutting downwards across the lateral muscles of the abdomen, and could be further lengthened by continuing up through these muscles parallel to the costal border to the edge of the rectus muscles. In this way a flap of the thorax could be turned upwards and the upper pole of the kidney and its pedicle directly reached *in situ* without luxation. The cutting of two to three ribs posteriorly facilitated this. The author illustrated his procedure well, and furthermore, described a method of opening the kidney itself in the plane of arterial division by means of a silver wire drawn from the pelvis side towards the convex border.

SURGICAL TREATMENT OF EPILEPSY

DR. W. P. CARR, of Washington, D. C., made a further report of results of twenty operations for idiopathic epilepsy of severe type and long standing. Six of the twenty cases might be called cured, having passed three or more years without seizures. All except one of these six had been well for four years or more. One as long as ten years. With one exception, those not cured were benefited in being free from convulsions for from two to seventeen months, or in having them in much lighter form and at greater intervals. One was not improved. He believed that the operation had not been tried in a systematic way since improved technique had made it possible and safe, and that his results warranted a further trial by surgeons of experience in brain surgery.

The operation consisted in making a large osteoplastic flap and examining the brain carefully for neoplasms, cysts, thickened patches of dura, exostosis, or depression of the skull, and any other abnormal conditions. These should be removed when possible. In many cases nothing would be found but a chronic œdematous encephalitis. Draining of the superabundant serum in such cases gave always temporary and sometimes permanent relief. The operation was safe; no cases have died, and the more extensive explorations had given the best results He had declined to operate upon mild cases having not more than three or four seizures a month, as the subject was still *sub judice* and positive results could not be guaranteed in any given case. But if even one or two bad cases could be cured in a hundred, the operation was justifiable and well worth trial.

He believed that the making of large osteoplastic flaps had done for brain surgery what the Sims' speculum did for gynecology, and that free and extensive examinations of the brain were now possible and safe. Consequently in obscure diseases exploratory craniotomy was as justifiable as exploratory laparotomy for obscure abdominal lesions.

They should no longer allow patients to die from hæmorrhage of the brain, even when the clots were situated at the base or when they could not be located before operation.

He gave details of the operation as done by himself, and exhibited a small trephine fitted to a small brace and provided with a safety shield that allowed it to cut only to the depth for which

it was set. This trephine could be fitted to any brace and rapidly and safely cuts a 5-16th inch hole just large enough to admit the De Vilbis craniotome with which the bone flap was cut. He also exhibited hæmostatic clamps of his own invention for controlling hæmorrhage from the scalp. These clamps were not in the way of the operator, were easily applied, and perfectly controlled the bleeding without damage to the scalp. Considerable time and loss of blood were saved by the use of these instruments, and the shock both from prolonged anæsthesia and from hæmorrhage was lessened materially.

With such methods many operations heretofore deemed impossible became easy and safe. The search for tumors, abscesses and clots, and other lesions was greatly facilitated, and operation in such affections as purulent meningitis and even tubercular meningitis seemed advisable when the patient was not improved by the present treatment. These operations should be done only by surgeons experienced in brain surgery, but in such hands exploratory craniotomy was justifiable and would be done in many obscure cases in the future.

SURGICAL SHOCK

DR. J. G. EARNEST, of Atlanta, Georgia, gave a description of three cases illustrating some of the phases of surgical shock. In the first, very pronounced and profound shock occurred from what would seem to be a trivial cause, uncomplicated with either drugs or hæmorrhage, and seemed to the author to favor the theory of reflex paralysis rather than reflex spasm. The second case was a prolonged fight for life in which the patient was kept alive and finally saved by artificial respiration and electricity. The third case was apparently an illustration of delayed shock.

SKIN STERILIZATION BY TINCTURE OF IODINE

DR. I. S. STONE, of Washington, D. C., in his paper gave several good reasons for the use of a better method of skin sterilization, the chief of which were as follows: 1. To save time. The patient was ready for operation immediately after sleep was induced by the anæsthetic. No time was spent in washing, etc., which to be effective required at least ten minutes. 2. The patient might be kept warm and dry during the entire seance, including the time of anæsthesia and operation. 3. If the incision must be extended or one made in another place, this quick method was most desirable. 4. The operator's hands might be sterilized with iodine, as the stain could be removed by a weak solution of aqua ammonia.

GASTRO-MESENTERIC ILEUS FOLLOWING GASTRO-ENTEROSTOMY

DR. THOMAS C. WITHERSPOON, of Butte, Montana, reported a case which taught the lesson, first, of the uselessness of gastro-enterostomy as a means of drainage for a paralyzed stomach. Second, the need of early stomach washing before marked paralysis and dilatation could be detected, to relieve tension and possibly to diminish intoxication. Third, if after several washings the stomach continued to dilate, the necessity of making free drainage by means of gastro-enterostomy should be considered. Fourth, the necessity of keeping the stomach and bowel as free from alimentary material during the first week or ten days after operative procedures on the alimentary canal as the patient's general condition would allow. He believed the nitrogenous foods were the most harmful. He had seen a reasonable number of these cases and he believed the majority of gastro-mesenteric ileus attacks were due to a similar cause, and this case threw light on the entire class. He believed it was reasonably apparent that the attack resulted from a trophic change in the spinal segment which had to do with innervating the stomach. The probability was that injury, operative shock, psychic shock, overfeeding and other causes which upset normal alimentary function or led to intoxication might bring about this condition. The author suggested that every case of gastro-mesenteric ileus which resisted stomach washing should be drained by means of a gastrostomy, and that such a drain be maintained until the stomach wall had regained its tone.

EXTRAPERITONEAL DRAINAGE AFTER URETERAL ANASTOMOSIS

DR. JOHN E. CANNADY, of Charleston, West Virginia, discussed the theoretical and practical value of extraperitoneal drainage after wounds of the ureter. Wounds of the ureter closed rapidly, even though there was considerable leaking of urine from the ureter. There was great difficulty in making an anastomosis of the ureter that would not leak. The author reported a case and described the technique followed in making an anastomosis and rendering the wound extraperitoneal. He spoke of the ease with which the wound was walled off by the sigmoid and parietal peritoneum. The success of the technique described was evinced by the easy convalescence of the patient. The technique described obviated the danger arising from either primary or secondary leakage at the point of union.

DR. THOMAS S. CULLEN, of Baltimore, detailed an interesting case of large cystic tumor, developing

from the ilio-psoas bursa, which contained large free cartilaginous masses, and communicated with the hip-joint.

DR. WM. S. GOLDSMITH, of Atlanta, Georgia, described a simple method of excising varicose veins.

DR. RANDOLPH WINSLOW of Baltimore, discussed some acute abdominal conditions in infants, under one year of age. He reported three cases of intussusception in infants; one case of strangulated hernia in an infant three weeks old. He then discussed appendicitis in infancy; congenital hypertrophic stenosis of the pylorus; congenital malformation of the anus and rectum; extensive obliteration or total absence of the rectum; imperforate anus, and cited cases illustrating each condition.

DR. J. E. STOKES, of Salisbury, North Carolina, detailed the symptoms and ultimate treatment of hydatidiform degeneration of the chorion, and reported an instructive and interesting case.

The following papers were also read: "Skin Grafting," by Dr. Arthur C. Scott, Temple, Texas; "Recent Observations on Surgery of the Pancreas," by Dr. Joseph C. Bloodgood, Baltimore, Maryland; "Anatomic, Pathologic, and Clinical Studies of Lesions, Involving the Appendix and Right Ureter, with Special Reference to Diagnosis and Operative Treatment," by Drs. John Young Brown, and Wm. Engelbach, St. Louis, Missouri.

OFFICERS

The following officers were elected for the ensuing year: President, Dr. W. O. Roberts, Louisville, Kentucky; First Vice-President, Dr. Joseph C. Bloodgood, Baltimore, Maryland; Second Vice-President, Dr. Lewis C. Morris, Birmingham, Alabama; Treasurer, Dr. Wm. S. Goldsmith, Atlanta, Georgia; Secretary, Dr. Wm. D. Haggard, Nashville, Tennessee.

Nashville, Tennessee, was selected as the place for holding the next annual meeting.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

JOHN B. MURPHY, M. D.
FREDERIC A. BESLEY, M. D.
WM. C. DANFORTH, M. D.
AIMÉ PAUL HEINECK, M. D.
G. T. COURTENAY, M. D.
WM. R. CUBBINS, M. D.
ARTHUR B. EUSTACE, M. D.
FREDERICK G. DYAS, M. D.
JAMES F. CHURCHILL, M. D.
GEO. E. BEILBY, M. D.

Experiments on Artificial Hæmostasis in Cranial Operations. F. SAUERBRUCH. *Zentralblatt für Chirurgie*, November 20, 1909.

Sauerbruch published three years ago the results of some experimental work along the above lines, in which he made use of positive pressure in the Saeurbruch cabinet, the head of the animal being within the cabinet. He was able to secure venous stasis at a pressure of 20 to 30 mm. Hg. arterial stasis at 70 mm. He noted that the brain itself was much compressed. Injury to the brain and the frequency of air embolism rendered this method entirely impractical.

During the past year Sauerbruch has carried out experiments along the same line by reversing the process, i. e., by placing the body of the animal within the cabinet and subjecting it to a negative pressure. A negative pressure of 20 mm. Hg. was sufficient to entirely control the venous bleeding, so that even the venous sinuses could be opened without danger. Arterial bleeding was not materially lessened by this pressure. At a negative pressure of 40 mm. there was some decrease in arterial circulation.

At the former pressure (20 mm.) the brain was slightly decreased in size and contained little blood. On retiring the pressure, the brain resumed its normal size and bleeding occurred.

As to the physiology, Sauerbruch finds that the negative pressure leads to an increase in the intrathoracic space, with a resulting aspiration of the venous blood from the head. The capillaries and veins of the trunk, especially those of the abdomen, are increased in size, accommodating the blood normally contained in the cranial vessels. Blood pressure in the femoral and carotid arteries is not affected. Pressure on the abdomen causes a return of the venous bleeding at once.

Hæmostasis does not occur when there is marked increase in the abdominal contents (distended bladder, pregnant uterus). Air embolism cannot occur on account of the collapse of the veins. No changes in the brain have been seen.

Whether or not this method can be made of practical value in surgery, Sauerbruch is not prepared to state. However, he considers it at this time, a relatively safe procedure. A further and more complete communication by Sauerbruch will appear at a later date.

J. F. CHURCHILL.

Primary Malignant Tumors of the Great Omentum (Contribution a l'étude des tumeurs malignes primitives du grand épiploon). L. LITCHKOUS. *Annales de Gynécologie et d'Obstetrics*, June, 1909.

Litchkous gives a detailed description of a case of primary malignant disease of the omentum and a short account of ten other cases from the literature, which he believes to be genuine cases of the same condition. His own patient was a woman of 20 years, suffering from pain in the abdomen, with swelling, of two months' duration, associated with diarrhœa, but with no menstrual disturbance. This abdominal enlargement was thought to be due to bilateral ovarian tumors and laparatomy was performed. The large mass proved to be a tumor growing in the lower two-thirds of the left half of the great omentum. A smaller swelling was discovered arising from the posterior layer of the left broad ligament and was densely adherent. Both were removed with the left ovary. The large tumor proved to be a round-celled sarcoma, the cells arranged for the most part in circles, and the blood-vessels, very numerous, having very thin walls.

Litchkous considers this case as one of primary sarcoma of the omentum with secondary growths in the peritoneum. Of the ten cases collected from the literature, five were carcinomata and five sarcomata. As to the origin of primary sarcoma, the author considers (1) the lymphatic glands of the mesentery, (2) the subperitoneal connective tissue, and (3) the external coats of the blood-vessels. He believes his own case to have originated according to this last theory. An effort is made to establish points of differential diagnosis from the clinical findings, and the prognosis is given as invariably bad, recurrence having taken place in all cases where the after history is stated.

CAREY CULBERTSON.

Relation of Iodin to the Structure of Human Thyroid Glands. D. MARINE AND C. H. LENHART. *Archives of Internal Medicine*, November, 1909.

Authors conclude that active thyroid hyperplasia is present in all developing goiters in all animals. All thyroid hyperplasia, so far as they can determine, is anatomically, chemically, and biologically the same. Thyroid hyperplasia develops in both normal and colloid glands.

Colloid glands, anatomically, chemically, and biologically, are the nearest approach to the normal gland that hyperplasias can become, and obey all the known biologic laws of normal glands in so far as these laws are at present known. The various degenerations, hæmorrhages, and cysts are secondary and complicating changes engrafted onto the three fundamental types of normal hyperplastic and colloid glands.

Iodin is necessary for normal thyroid activity. The iodin content varies inversely with the degree of hyperplasia. The percentage of iodin present in the thyroids is variable, but there is a quite constant minimum percentage necessary for the maintenance of normal or colloid gland structure. Iodin is taken up rapidly by the thyroid, the rapidity depending on the degree of active hyperplasia. Mild degrees of thyroid hyperplasia accompany or follow many of the chronic nutritional disturbances without detectable clinical symptoms referable to the thyroid.

Exophthalmic goiter isconstantly accompanied during the progressive stage of the disease by thyroid hyperplasia and the iodin percentage varies inversely with the degree of hyperplasia. In endemic cretinism the fibrous overgrowth with atrophy of the gland cells is consequent on active hyperplasia and is associated with very low iodin content.

In myxedema the anatomic and iodin changes are similar to those of cretinism. ARTHUR B. EUSTACE.

Symptoms of Basedow's Disease in Thyroid Neoplasms (Über Basedowsymptome bei Schilddrüsen neoplasmen). ISIDOR LÖWY. *Wiener klinische Wochenschrift*, 1909, xxii, 1671.

After a thorough review of the literature Löwy reports two cases of carcinoma of the thyroid with symptoms of exophthalmic goiter. He then discusses the nature of the symptoms in this condition without arriving at any definite conclusion as to their cause. He thinks that one may doubt their connection with the tumor mass, since they have also been noted in sarcoma. C. G. GRULEE.

The Transplantation of the Thyroid by Means of Vessel Suture (Zur Transplantation der Schilddrüse mittels Gefässnaht). R. STICH AND M. MAKKAS. *Beiträge zur Klinischen Chirurgie*, bd. 60.

These writers operated ten times upon dogs. In three of their cases the thyroid was reimplanted in the same animal from which it had been removed. In the remaining seven it was implanted in another animal of the same species. In all cases in which the gland was implanted in a second animal, all thyroid tissue was previously removed from the animal upon which the transplantation was made. Accessory thyroids, not seldom found in dogs, were removed so far as possible.

Of the three cases in which the thyroid was reimplanted in the same animal two were successful, and at an autopsy in vivo 51 to 245 days later the gland was found in good condition, with a sufficient circulation, and the parenchyma well preserved. The size of the glands had not changed. One of these animals remained in good health so long as the implanted gland remained in place, but after its removal, at a second operation, it showed at once symptoms of tetany, and died in three weeks.

All seven cases of transplantation of thyroids from one animal to another failed.

Conclusions are as follows:

1. It is possible to reimplant a thyroid which has been entirely removed from the body, and which has been kept as long as 1½ hours outside of the body, into the animal from which it was taken, and by vessel suture to cause it to live.

2. This reimplantation is permanent as is shown by a period of observation of an operated case of 245 days.

3. The reimplanted organ keeps not only its normal structure, but is also in condition to carry on fully its physiologic function.

4. The transplantation of thyroids from one animal to another did not succeed. W. C. DANFORTH.

A Disease of the Gall-bladder Requiring Cholecystectomy. B. G. A. MOYNIHAN. *Annals of Surgery*, vol. l, p. 1265.

Moynihan concludes that:

1. There is a condition of the gall-bladder in which fine grains of calculous material are imbedded in the mucosa; the cystic duct is not affected.

2. The wall of the gall-bladder may appear normal. It may retain the blue color of health and the walls are thin and supple. It may be white and thickened slightly or grossly, in part or in whole.

3. No stones are free in the gall-bladder, though particles of grit may be found in the bile therein.

4. Chronic pancreatitis may be present in the more advanced cases.

5. Inspection of the mucosa of the gall-bladder is necessary to reveal the presence of this condition in its early stages; it cannot otherwise be recognized.

6. Removal of the gall-bladder is necessary; drainage of the common duct may be desirable in cases where jaundice has been present.

Moynihan includes three illustrative cases of the above in his article. ARTHUR B. EUSTACE.

Appendicostomy In Conditions of Acute Peritonitis. ERNEST W. HEY GROVES. *Annals of Surgery*, vol. l, p. 1334.

The author summarizes the conclusions to be drawn from his article as follows:

1. The value of appendicostomy in acute diffuse peritonitis is very great in these respects. It serves to introduce saline fluid at will in almost any quantity after operation. The introduction is likely to be more efficient than if given by the rectum, especially in children. It is less disagreeable to the patient and involves less exposure in moving than does rectal infusion. It serves as a ready means of washing out the large intestine, relieving pain, distention, and the retention of toxic intestinal contents.

2. It is rather a quicker and simpler operation than removal of the appendix.

3. The smallest possible piece of appendix should be retained, enough to preserve the sphincter at its base, and no more.

4. It is better not to tie in a tube but to reinsert whenever necessary. ARTHUR B. EUSTACE.

Principles of a Radical Treatment for Proctosigmoiditis. PROF. DR. RAFFAELE BASTIANELLI. *Annals of Surgery*, vol. l, p. 1095.

Bastianelli believes that in cases of stricturing proctitis or proctosigmoiditis, the treatment is to be as follows:

1. Cæcal anus and laparatomy, exploration of bowels.

2. Perineal or combined removal of the diseased section, in one or two stages, with mobilization of sigmoid and colon if necessary, and preservation of sphincter.

3. Closure of cæcal anus.

4. Plastic operation if necessary.

The author emphasizes the importance of resorting more frequently to the abdominal route in the treatment of strictures of the rectum for the purpose of preliminary exploration, and the importance of exact ligating and cutting the arterial supply from the abdomen, even in cases of perineal operation, to prevent any damage to the circulation. ARTHUR B. EUSTACE.

Experiences and Opinions Concerning Suture of Wounds of the Heart (Erfahungen und Ansichten über die Naht der Herzwunden). KARL EWALD. *Wiener klinische Wochenschrift*, 1909, xxii, 1817.

Ewald reports a case with death four weeks after operation from pneumonia. He advises caution in undertaking the operation in fresh wounds, to suture the pericardium completely, introducing a drain only as far as the pericardium, and to disregard pleural wounds unless there is a severe hæmorrhage from the lungs. He thinks the plastic methods of opening the thorax are of secondary value. C. G. GRULEE.

Total Epiploitis Complicating Salpingitis (Epiploite totale compliquent une Salpingite). DR. MAUCLAIRE. *Archives Générales de Chirurgie*, September 25, 1909.

Partial epiploitis limited to the inferior border of the omentum is a condition frequently found in the course of salpingitis. Total or subtotal epiploitis of the same origin is rather uncommon. The author reports a case and discusses other cases which have appeared in the literature. In the case which he reports, after incision of the abdominal wall, he came upon a suppurating omental mass adherent to the anterior abdominal wall and to the right adnexa. The omentum formed a voluminous, sausage-shaped mass lying transversely. That portion of the omentum adherent to the abdominal wall and the right adnexa were removed. Drainage. Discharge of pus for some time. At the end of six weeks, recovery was complete.

Extra-abdominal epiploitis of hernial origin and intra-abdominal epiploitis of appendicular origin have been quite thoroughly studied. Total or subtotal extra-abdominal epiploitis of hernial origin is of more common occurrence than is generally believed Exceptionally, it occurs in voluminous inguinal hernia, but is more commonly met in umbilical hernia and in large eventrations, either of spontaneous or of post-operative origin.

In cases of total or subtotal intra-abdominal epiploitis, the following symptoms are noted in the early stage: Pain, digestive disturbances, anorexia, nausea, vomiting, symptoms of febrile state, peritoneal disturbances, etc. Locally, one feels a hard, distended, painful periumbilical swelling adherent to the abdominal wall. At times one palpates a tender mass, at times a diffuse infiltration more or less adherent to the abdominal wall and inseparable from it. In this, as in other varieties of epiploitis, suppuration and gangrene may be observed. The pus focus may undergo resorption; the omentum being the phagocytic organ "par excellence." The pus collection may become adherent to and evacuate itself into the urinary bladder, into the intestines; may burst through the abdominal wall if the epiploitis be paraumbilical in location. Epiploitis secondary to adnexal disease has to be differentiated from appendicitis, from diffuse and encysted peritonitis, from tuberculous and cancerous peritonitis, etc.

The prognosis is not very grave; spontaneous resolution is nearly always the rule. However, the omentum, owing to the formation of adhesions, may lead to symptoms of intestinal obstruction. Intra-abdominal omental torsion is a possible complication. The author is of the opinion that in the presence of suppurating epiploitis an early incision is indicated. Often, the adhesions to the adnexa are so intimate that it is necessary to remove the adnexa with the omentum. AIMÉ PAUL HEINECK.

Diffuse Peritonitis. JOHN B. DEAVER. *Annals of Surgery*, vol. l, p. 1303.

The author sums up the essential treatment of peritonitis as follows:

1. Early operation.
2. Light anæsthesia.
3. Rapidity of operation.
4. Appropriate treatment of focus of infection.
5. Avoidance of flushing and evisceration.
6. Proper drainage.
7. Simple post-operative treatment by posture and proctoclysis with predigested beef for the purpose of nutrition. ARTHUR B. EUSTACE.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF OBSTETRICS

UNDER THE CHARGE OF

C. S. BACON, M. D. RALPH WALDO LOBENSTINE, M. D.
HELIODOR SCHILLER, M. D. C. G. GRULEE, M. D.

The Surgical Treatment of Placenta Prævia (Placenta Prævia, son traitement chirurgical). R. LABUSQUIÈRE. *Annales de Gyn. et d'Obst.*, July and August, 1909.

The writer's deductions regarding the surgical treatment of placenta prævia are based almost entirely on the clinical conclusions of various operators. He first quotes Sellheim and Krönig, the former of whom recommends extraperitoneal Cæsarean section, while the latter prefers the classical conservative section. Statistics are quoted from each showing results favorable to both mother and child, though the number of cases reported is small.

Baisch, writing from Döderlein's clinic, advocates vaginal hysterotomy, admitting that this operation is of little value to the general practitioner. A. Martin protests vigorously against the newer methods of Krönig and Sellheim and upholds the use of the metreurynter in all cases, fearing that its neglect will cause harm. In none of his cases has J. Veit seen an indication for Cæsarean section. Blumreich found Cæsarean section necessary in but one case out of a series of 74 cases of placenta prævia. In this one case the condition was a rigidity of the cervix. Hannes strongly advocates metreurysis. He quotes 246 cases from Kustner's clinic, none of which was treated by section. The maternal mortality was 6.6 per cent, while 30 per cent of the babes were lost. In this series cases are excluded where the child was dead or not viable before the operation.

Metreurysis is also upheld by Pfannensteil and Thies. The latter, from Bumm's clinic, gives the fœtal mortality of different operations as, 20 per cent in spontaneous delivery; 33 per cent in vaginal tampon or colpeurynter; 80 per cent in combined version with slow extraction; 64 per cent in combined version with rapid extraction; 50 per cent in vaginal Cæsarean section; 14 per cent in metreurysis. Zimmerman collected a series of cases treated by the metreurynter in which the maternal mortality is 33 per cent, the fœtal, 23.7 per cent. In 28 cases of his won there was a loss of neither mother nor child. Newall considers early diagnosis the important factor in the successful treatment of placenta prævia. He rather favors combined version with slow extraction, but admits the value of Cæsarean section in certain cases. Mason and Z. Williams advise Cæsarean section for primiparæ but for multiparæ combined version with rapid extraction. Labusquière finally gives a summary of the discussion on this subject at the recent meeting of the American Gynecological Society. He concludes that Cæsarean section is only occasionally necessary and then done only under favorable conditions and by competent operators. Judging by the results obtained in the Clinique Bandelocque, where the method employed is to rupture the membranes and insert a de Ribes' bag, the writer believes also that the indications for hysterotomy must be exceptional. CAREY CULBERTSON.

Some Remarks on the Clinical Picture of the Climacteric, Functional Disturbances of the Glands with Internal Secretion (Einige Bemerkunger zum klinischen Bilde des Klimacteriums Funktionsstöumgen der Drüsen mit innerer Sekretion). ANTON GLUZIŃSKI. *Wiener klinische Wochenschrift*, 1907, xxii, 1663.

Gluzinski believes that the atrophy of the ovaries at the time of the menopause is frequently associated with a more or less prolonged inhibition of the thyroid secretion resulting in myxedematous symptoms of slight or severe degree, such as roughness and dryness of the skin, clumsiness, weakening of the mental powers, tendency to obesity, etc. He cites several conditions which would tend to show some interdependence between the function of the thyroid and that of the ovaries, but cautions against a too wide application of his theory.
C. G. GRULEE.

Extract of 'Corpus Luteum in Disturbances of Artificial and Physiologic Menopause. MORLEY. *Journal of the Michigan State Medical Society*, November, 1909.

The author reports his results in eighteen cases. This report is a continuation of the one that appeared in the August number of the *Detroit Medical Journal*. The author used an extract made from the corpora lutea of beef ovaries rather than an extract of the entire ovary, as the censensus of opinion seems to be that the internal secretion of the ovary is produced by the yellow body. The extract is given in five-grain doses, three times a day, one-half to one hour before meals. His results in eighteen cases may be summed up as follows:

Five were cured, twelve were improved and one obtained no relief. Included in the twelve cases that were improved are grouped these that are still taking

the extract. A permanent cure may result in a few of the cases under treatment. Of the eighteen cases, fourteen suffered from disturbances of operative or artificial and four from those of natural or physiologic menopause. While the results obtained in so small a group of cases do not warrant the drawing of any definite conclusions, still the author thinks that the results are favorable enough to justify a continuance of the treatment in other cases, where there is disturbance incident to artificial or physiologic menopause.

The Secretion of Antitoxins and Precipitinogen through the Milk of a Passive Immunized Mother. DR. SOHMA. *Monatschrift fur Geburtschilfe und Gynækology*, bd. xxx, h. 4.

Sohma investigated to learn whether the antitoxin which, as Ehrlich showed, can be found in the milk of the nursing mother animal, remains fixed to the albumen of the animal, from which the serum came, or whether it passes over to the albumen of the animal that was passively immunized. The experiments showed:

1. In the milk of animals injected subcutaneously with tetanus antitoxin of horses, antitoxin or serum-albumen of horses is present.

2. According to the amount of serum injected, one part or even the whole amount of the antitoxin remains fixed in the albumen of horses.

3. The serum of the suckling nursed by an animal which was passively immunized does not contain any, or only a very minimum, trace of tetanusantitoxin or horse-serum quite the contrary to the finding in the actively immunized mother. HELIODOR SCHILLER.

The Causes of the Child's Position and the Relation to the Uterus (Die Ursachen der Kindeslagen und die Turnkunst un Uterus). SCHATZ. *Prager Medizinische Wochenschrift*, 1909, xxxiv, 655.

Schatz regards the uterus as a sac with three funnel-like corners. About two months before birth the child turns itself by extending the leg on the thigh and as a consequence the foot slips into one of the upper funnels and propels the body around the buttocks as a sort of axis. Where the fœtus is small or there is an excess of liquor amnii the propulsion takes place not only with the leg but with the thigh also, and as a consequence malpositions are more frequent.

C. G. GRULEE.

On the Treatment of Puerperal Convulsions. HERBERT M. LITTLE. *Journal of Obstetrics and Gynæcology of the British Empire*, September, 1909.

Little's article is based on the records of the Maternity in Montreal since 1905, 43 patients having had convulsions out of 2,350 cases. Of these 43 patients, the author considers but 40 as genuine eclamptics and bases his observations on the study of them alone. Twenty-one of the patients developed convulsions before term, ten at term, and nine after confinement. Albuminuria was present in all cases and the pelvis was normal in every instance. Persistent nausea and vomiting was frequently noted, but disturbed vision was observed but once. The blood pressure varied between 125–200 mm. Four of the cases (10 per cent) died.

As regards treatment, delivery as speedily as possible was accomplished as follows:

Spontaneous delivery	4
Spontaneous delivery after induction of labor	1
Forceps, after complete dilatation	2
Vaginal Cæsarean section	1
Pomeroy bag and forceps	2
Pomeroy bag and Braxton-Hicks' version	1
Dilatation — Edgar Bonnaire — with forceps	4
Dilatation — Edgar Bonnaire — with craniotomy	1
Dilatation — Harris — with forceps	8
Dilatation — Harris — with version	6
Version and extraction	1

Fifteen patients were immediately delivered; of these one child was not viable, and one was dead in utero upon admission. Of the remaining thirteen, twelve live babies were obtained = 92 per cent. Of the sixteen patients not immediately delivered, two babes were dead in utero and one was not viable. Of the remaining thirteen, but three live babes were obtained, 23 per cent. This gives a difference of 69 per cent in favor of the child when immediate delivery is effected.

The morphia treatment of the rotunda was employed in one case, one of the fatal ones. Three patients had veratrum, and chloral was given in a few cases, both with indifferent results. Nitroglycerin and pilocarpin were not used. Vaginal section is considered as indicated only where the cervix is so rigid as to be undilatable by other means. Tears of the cervix occurred frequently, only three not being appreciably damaged and repair by suture being employed in nine cases following delivery. Sweating was induced with the hot pack and hot air bath, and venesection was employed in certain conditions. Fluid is given freely and magnesium sulphate is the favorite laxative.

In conclusion Little suggests the following rules:

1. Minimize the use of narcotics and anæsthetics. Chloroform is rarely indicated for control of convulsions, but should be used where general anæsthesia is is required for examination or delivery.

2. Immediate delivery is advisable, particularly when the child is viable.

3. In the majority of cases the onset of labor is more or less intimately associated with the onset of convulsions; accouchement forcé — preferably Harris's method followed by version — has given the best results.

4. Immediately after delivery, if not before, the stomach should be washed out, and several ounces of magnesium sulphate, well diluted with warm water, should be introduced through the tube. The patient should then be sweated by means of a hot air bath or hot pack.

5. If convulsions recur after delivery, and particularly in post-partum eclampsia, the best results are obtained by withdrawing 700–900 cc. of blood from one of the veins of the forearm.

6. A large quantity of fluid (forced fluids) should be given for several days, and the amount so given

should be carefully tabulated for comparison with the amount of fluid eliminated in the urine and stools. If the excretion is inadequate, repeat the sweating and purgation. Do not allow the patient to become waterlogged.

7. Careful records of ingestion and excretion should be kept for at least ten days, as the involution of the uterus has a marked effect on the general metabolism, particularly between the sixth and ninth days.

CAREY CULBERTSON.

The Technique of Extraperitoneal Cæsarean Section and Delivery through a Uteroabdominal Fistula. HUGO SELLHEIM. *Beitr. z. Geburts. u. Gynaek.*, bd. xvi, h. 1.

The classic Cæsarean section is a reckless operation when the operator does not take into consideration the modern principles of asepsis, the avoidance of injury to an organ whose function might be impaired, and the avoidance of hæmorrhage. Therefore, the technique needs improvement, the more so as its results in infected cases are *nil*. The classic Cæsarean section injures the center of the uterus instead of the part naturally predisposed to expansion — the cervix and isthmus. The injury will doubtless be less significant if made in a part more protected by nature and physiologically less important, and the hæmorrhage can be more easily controlled. The cervix of the non-pregnant uterus has less blood-vessels than the fundus. The difference increases during pregnancy through the development of the placenta in the fundus. The isthmus and cervix remain comparatively lacking in blood-vessels. An incision here has the further advantage of avoiding the peritoneum.

Based upon many anatomical preparations, the author now describes the shifting of the peritoneum of the bladder to the uterus in the pregnant. He shows how the lower part of the uterus becomes to a large extent extraperitoneal, how the growing uterus draws the peritoneal covering of the bladder upwards, and how towards the end of the pregnancy, the bladder lies extraperitoneally upon the uterus and vagina, thus opening a way for an extraperitoneal incision. While variations of this are found, it is nevertheless the rule.

The first step for his extraperitoneal section is a steep Trendelenburg position, the bladder is emptied, Pfannenstiel's incision made. The next step depends upon the condition of the peritoneum of the bladder. A small incision in the peritoneum, which is immediately very securely closed, will clear the situation. Nearly all of the peritoneum of the bladder is pulled upward by the uterus, and this is the rule. Then it will be an easy matter to get extraperitoneal access to the isthmus and cervix. If, however, a part of the peritoneum is tightly attached to the bladder, then the author advises, in order to avoid injury to the bladder, to leave it, to circumcise it, and to sew the defect of the peritoneum securely. The peritoneum of the uterus is now pushed upward, by means of a sponge, as far as possible. The flap of the peritoneum originally attached to the uterus is now sewed towards the parietal peritoneum of the transverse incision, making the new plica vesico uterina. This part is now pulled as far as possible upward, the bladder pulled downward, thus exposing an extraperitoneal space of the uterus about 15 cm. long. The lowest point of this might be the external os or vagina, or the cervix. The wall of the uterus is now incised between two tissue forceps, the wounds are grasped with arteric forceps. The lower down the incision is made, the less hæmorrhage is encountered. It can be avoided completely if the incision is made between arteric forceps, but it will often become necessary to remove the clamps before the delivery, for lack of space. The head of the baby is now pushed by means of the fingers into the wound. If this is impossible, forceps or version might be employed. After delivery ergot is injected, the placenta if necessary expressed or the uterus packed, exact closure of the incision by through and through stitches, with an eventual second row of suture. The next step is to sew the artificially raised plica vesico uterina downward, the bladder upward into its place and close the abdominal wall. The puerperium is in most cases as simple as in a normal confinement.

In regard to the best time for this operation the author says: In the anticipation of the indications rests the result of it, the earlier the better, and better too early than too late, however, always before the natural powers go bankrupt.

This method will enable us to operate upon cases in which other operations, as forceps, have been previously used in vain, cases which contraindicated the classic Cæsarean section. A manifest infection, however, is a contraindication of the extraperitoneal section on account of the danger of infecting the large exposed connective tissue of the pelvis. For these cases in contracted pelvis, perforation is indicated. In two cases Sellheim established a uteroabdominal fistula with good results. He made a long incision in the linea alba, sutured the parietal peritoneum securely to the skin, cut the peritoneum of the uterus, sutured it to the parietal peritoneum, and incised the wall of the uterus,— the membranes are ruptured beforehand through the vagina — the wall of the uterus was grasped with arteric forceps and pulled before the abdominal wound. After delivery of the baby the cut ends of the uterus are sewed to the skin. The fistula will close sooner or later. If not, it will become necessary to mobilize the wall of the uterus and close it by a suture. This proceeding will enable us to operate infected cases and preserve the life of mother and child.

HELIODOR SCHILLER.

BOOK REVIEWS

A Textbook of General Bacteriology. By Edwin O. Jordan, Ph. D. Philadelphia and London: W. B. Saunders Company, 1908.

This book is the outcome of lectures given to the students of the University of Chicago (Rush Medical College) during the past few years.

The author says the subject is one that he believes should find a place in every general scientific course. Bacteriology is chiefly of professional interest to medical students, but the subject also bears technical relation to household administration, agriculture, sanitation and sanitary engineering, to various industries and technological pursuits. For the general scientific student and reader bacteriology presents certain aspects that tend to widen the outlook upon a variety of human interests.

A Handbook of Medical Diagnosis. By J. C. Wilson, A. M., M. D. Philadelphia and London: J. B. Lippincott Company, 1909.

While to the making of books there may be no end, still from time to time contributions to medical literature appear that mark stages in the development of our knowledge of this science. In the present volume of 1,400 pages, Wilson has produced a work which cannot fail to stand as a monument to his own painstaking care as well as mark the distinct progress that has been made in the last decade to our increased knowledge of the methods of diagnosis. It is clearly and concisely written, yet covers with sufficient completeness all phases of the question of medical diagnosis. The general heads, Medical Diagnosis in general, Methods of Diagnosis and their Immediate Results, Symptoms and Signs, comprising the first 600 pages, include a most satisfactory discussion of all these various phases, while the clinical applications covering the various diseases serves to emphasize in the individual affection the various principles which he has detailed so clearly, earlier.

Another point which is worthy of commendation is that the various pictures and drawings which are introduced serve in each case to illustrate vividly some vital point. There is none of the introduction of photographs simply to fill up space. Also, the colored plates, particularly those of the blood, are clear representations of the microscopical picture found in stained specimens, and gives the student a satisfactory idea which so many of the colored plates ordinarily seen in text-books fail to do.

The modern phases of diagnosis, such as the opsonic index, the use of the X-ray, and serum diagnosis, has received adequate mention.

In every way the book can be recommended to students and the practitioner.

Physician's Pocket Account Book. By J. J. Taylor, M. D. Philadelphia: Medical Council.

This account book seems to possess a number of advantages over the majority of those on the market. It can be started at any time during the year and be used until filled. The entries are made in writing, not in signs. It is of convenient pocket size, bound in limp leather.

Principles and Practice of Physical Diagnosis. By John C. Da Costa, Jr., M. D. Philadelphia: W. B. Saunders Company, 1909.

Da Costa has written a clear, concise text on the principles of physical examination and their application in the diagnosis of disease of the thorax and abdomen. The exploration of the physical signs on the basis of the underlying pathological condition is one of the strong features of the work.

The book is written by a man who has evidently had a large amount of teaching experience and who has first had knowledge of the needs of the student.

The illustrations are good, being for the most part original photographs of patients, models, and pathological specimens.

The book is unusually brief for one on physical diagnosis and can be recommended as a text-book for medical students and as a reference book for the general practitioner.

BOOKS RECEIVED

A System of Syphilis. Volume III. Edited by D'Arcy Power and J. Keogh Murphy. London and New York: Oxford Press, 1909.

Practical Medicine Series. Volume IX. Skin and Venereal Diseases. By William L. Baum, M. D., and Harold Moyer, M. D. Chicago: The Year Book Publishers, 1909.

A Practical Treatise on Ophthalmology. By L. Webster Fox, M. D. New York and London: D. Appleton & Company, 1910.

Diseases of Children. Edited by Abraham Jacobi, M. D. New York and London: D. Appleton & Company, 1910.

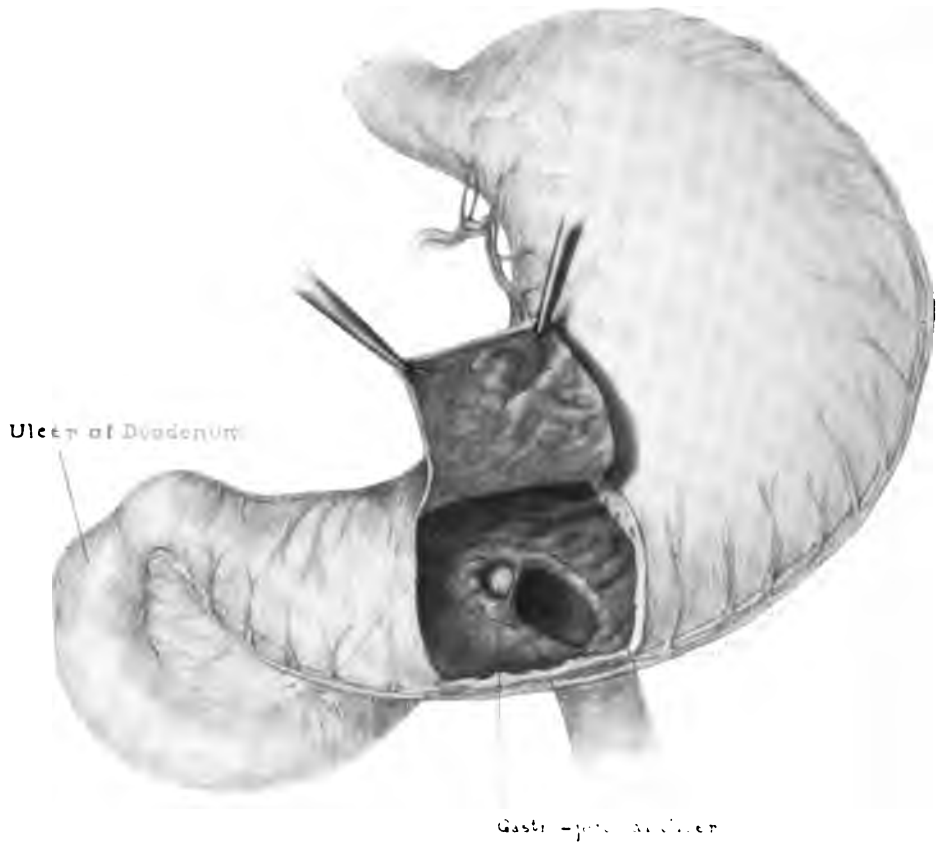


Fig. 1. Gastrojejunal ulcer, the result of infected hæmatoma. (Case 3.)

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GASTROJEJUNAL ULCERS (PSEUDOJEJUNAL ULCERS)

BY WILLIAM J. MAYO, M. D.
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THE writer has made an investigation of all the cases in which gastrojejunostomy has been done in St. Mary's Hospital, Rochester, Minnesota, to ascertain, if possible, if jejunal ulcer has occurred as a secondary condition.

The total number of operations performed upon the stomach and duodenum up to December 31, 1909 (C. H. and W. J. Mayo), was 1,775. Of these 1,141 were gastrojejunostomies. In 715 cases the operation was for duodenal and gastric ulcer, in 167 cases for cancerous obstruction at the pylorus, and 259 were in connection with partial gastrectomy. The large majority of the latter operations were for malignant disease.

Of the whole number, as far as any knowledge could be obtained, not a single case developed true jejunal ulcer; nor have any such cases come to our clinic in which gastrojejunostomy had been performed by other surgeons.

It must be admitted that we might not have recognized a jejunal ulcer had we encountered one, and it is possible that some of the cases in which symptoms continued after operation were due to an undiagnosed jejunal ulcer. It is also possible that some of our patients may have fallen into the hands of other surgeons who have found and operated upon them for this secondary condition.

Acid gastric secretions when diverted into the jejunum (in connection with lowered local resistance) are undoubtedly the active causes of peptic ulcer, but we should remember that the jejunum is continuously bathed in the alkaline pancreatic and biliary secretions, and that the jejunum is, therefore, much better protected than the stomach and upper duodenum where peptic ulcer ordinarily appears.

Herbert J. Paterson (Annals of Surgery, August, 1909) has made a most important contribution to the subject of jejunal ulcer. He tabulates in detail the fifty-two cases recorded, reporting one typical case of his own. Mr. Paterson points out, however, that "nearly one-third of the reported jejunal ulcers involve both the stomach and jejunum." They were found in the line of anastomosis and were, therefore, gastrojejunal, although originally classed as jejunal ulcers. He says: "Jejunal ulcers are the result of altered physiological conditions produced by operation; gastrojejunal ulcers are probably a direct consequence of operation." I quite agree with Mr. Paterson that the latter cases should not, without qualification, be grouped with jejunal ulcers, but should be classified separately as "gastrojejunal ulcers." I believe that we should view most gastrojejunal ulcers as due to technical failures in the operation itself rather than an unavoidable condition which, up to the present time, true jejunal ulcer appears to be.

We have had three cases corresponding to the gastrojejunal or pseudojejunal type of ulcer. A brief report of them is herewith appended.

CASE 1. St. Mary's Hospital records. May 5, 1899. *Gastrojejunal ulcer, result of impacted button.* Female, aged 38. Married eleven years. Three children, youngest four years. Menses absent for seven months. Has lost over twenty pounds in weight. History for several years of "spells of stomach trouble" in periods lasting from a few days to a few weeks and marked by acid eructations and a burning feeling when the stomach is empty, especially several hours after taking food. Vomiting frequent for the past two years, and for several months the act has been induced once or twice a day to empty the stomach of its contents. The vomitus contains much partially digested food; no blood.

Present condition. Emaciated woman presenting no evidences of disease outside of the stomach. The stomach greatly dilated and somewhat prolapsed, its lower border extending downward nearly to the pelvic brim. The content of the stomach was withdrawn with a tube and contained a great quantity of fermenting food stuff with a musty odor.

Diagnosis. Pyloric obstruction. Operation May 7, 1899. A calloused ulcer was found obliterating the pylorus and reducing its caliber to about that of a lead pencil. Anterior gastrojejunostomy with the Murphy button was performed, Button not passed.

Subsequent history. Patient gained over thirty pounds in weight; felt quite well and was able to attend to her household duties until three years and nine months after operation when she had a sudden attack of abdominal distress supposed to be appendicitis. This was at once followed by symptoms of obstruction and constant interference with the progress of food from the stomach. A tender mass was palpated just to the right of the umbilicus. Operation April 2, 1902. A mass of adhesions attached to the abdominal wall was encountered about an ulcer which had perforated the stomach immediately above and to the right of the original gastrojejunostomy opening. The ulceration began at the site of the stoma, the jejunal mucous membrane forming the lower border of the ulceration. The button was found in the stomach somewhat corroded. When passed downward into the site of the gastrojejunostomy, the button was seen to fit closely into the site of the ulcer. Evidently the acute symptoms were due to the button dropping into the opening, producing obstruction and a pressure ulcer. It was noted during the operation that the button became dislodged with the manipulations. The ulcer was excised and a large plastic gastrojejunostomy done over a Robson bone bobbin. The patient recovered and has remained well.

CASE 2. St. Mary's Hospital records. January 22, 1904. *Gastrojejunal ulcer the result of retention of infected suture material.* Male, aged 54. Came for examination seven months subsequent to a gastrojejunostomy performed by a competent general surgeon in a distant city. History for past twenty-four years. Dyspeptic; better and worse by spells but gradually losing ground. Gas eructations, burning distress in the stomach eased by taking food, alkalies, or diluants. Gastrojejunostomy seven months ago which gave temporary relief but was followed by more pain and tenderness and occasionally bile vomiting. Pain different in character and seemingly located to the left of umbilicus. Cicatrix of former operation in midline between umbilicus and ensiform cartilage. Stomach splashy, prolapsed but evidently protected by the abdominal muscles against sudden motion. Acids normal, but some food remnants found in gastric contents after five and one-half hours. Small quantity of bile present. Operation January 28, 1904. Incision two inches to the left of the midline. Dense adhesions encountered. Site of gastrojejunostomy exposed; a posterior operation on a nine inch loop. On the anterior margin of the gastrojejunostomy a thickened spot was discovered covered by recent adhesions and having the appearance of a perforation, evidently the cause of the general abdominal adhesions previously encountered. The stomach was opened just above this point close to the line of the gastrojejunal union, exposing an ulcer with a thickened base in the line of union. The ulcer was about one cm. in diameter and undermined at the inner side. The floor of the ulcer was hard and smooth, but just at the point of undermining a projection was seen which proved to be a silk suture in communication with the gastrointestinal cavity. The suture was removed, the ulcer excised, and a large plastic gastrojejunostomy done at the site of the opening. A suture enteroanastomosis between the limbs of the jejunum was then done and the pyloric ring excised, the stomach and duodenal ends turned in. The patient made a rapid recovery and when last heard from two years after the operation, was in good health.

CASE 3. St. Mary's Hospital records. March 10, 1907. *Gastrojejunal ulcer, the result of injected hæmatoma in the suture line.* Male, aged 34. Fourteen years ago began to have "spells" of stomach trouble, pain, gas, sour eructations, heartburn two to six hours after meals, eased by taking food. No vomiting. A year ago he became much worse. Epigastric tenderness and attacks of severe pain at irregular intervals radiating to the right. In May, 1906, an exploratory operation for gall stones was done by his home physicians; no stones found. Has been taking morphia daily for more than a year. Lost forty pounds in weight.

Physical examination. Emaciation marked. Urine contained small amount of albumen and a few casts. Except for stomach symptoms, patient normal. Stomach moderately dilated. Test meal shows total acidity 94; hydrochloric 70; combined 20.

Diagnosis. Duodenal ulcer. Operation March 18, 1907. Large duodenal ulcer; subacute perforating, protected by adhesions. Posterior no-loop gastrojejunostomy. A small hæmatoma was formed by the accidental pricking of a vein in the transverse mesocolon, necessitating supplemental sutures. Patient made a good recovery, gained 39 pounds in weight and stopped morphine. Re-examination November 24, 1909. For more than a year following the gastrojejunostomy had had no further trouble except for some localized soreness to the left of the umbilicus.

About three months ago this tenderness increased and was accompanied by many of the former symptoms though less in degree. No vomiting, but constant pain. Test meal shows total acidity 84; hydrochloric 70; combined 14. Urine specific gravity 1,028. Acid. Hæmoglobin 86 per cent.

Operation December 4, 1909. An ulcer was found in the line of the gastrojejunostomy opening about one and one-half cm. in diameter, extending into the fatty tissue of the mesocolon at the point of the former hæmatoma. The ulcer base was hard and smooth, composed of fibrous tissue and fat. The whole of the gastrojejunostomy opening, together with the ulcer, was excised and the stomach and jejunal openings completely closed. A large Finney gastroduodenostomy was done at the site of the original duodenal ulcer which had healed and contracted down. Examination of the excised gastrojejunal ulcer showed it to be a cavity in the fatty tissue and not containing in its floor either stomach or intestinal tissue. (Fig. 1.)

EXCISION OF THE FAT OF THE ABDOMINAL WALL—LIPECTOMY

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To be a storehouse for useless adipose tissue and to carry this handicap around openly displayed wherever one goes is one of the most distressing of life's minor ailments.

An unsightly, gross exaggeration of the normally graceful outlines of the human figure, oftenest by a perverse fate, affects the beautiful figure of woman designed by nature to be the expression of her supreme effort in the realization of perfect, concrete beauty of form. Excess of fat may be universally distributed, as in the case of the celebrated Daniel Lambert and the "fat ladies" at traveling shows, or oftener show a tendency to abdominal localization, in or under its walls, in its omentum, or packed about the viscera.

Fat shows strange freaks in this way, for which physiology as yet offers no adequate explanation. The large, localized pendulous accumulations about the back or buttocks form the ordinary lipoma so long familiar in medical literature, and the joy of the younger surgeon, while the extraordinary periodical accumulations in the buttocks of the Bosjesmen (steatopygia) are as clearly physiological as the great nutritious butter-tails of the African sheep.

The most frequent place for accumulation of a huge roll of fat in women taking on adipose near the change of life, is in a great transverse roll which hangs across the lower abdomen below the umbilicus, forming a crease, often madid and eczematous just above the symphysis.

Fig. 1. Shows case of fat, pendulous abdomen. The abdomen hangs within two inches of the knees. Patient's weight 285 pounds.

The unwieldy pendant mass of fat in this position is peculiarly distressing to the woman. Is it a disease? What else? I think it is only because the condition has been looked upon as natural as well as inevitable and irremediable that it has as yet received so little attention.

A woman who is hampered with this bolster or hammock laden with fat is always unwieldy in appearance, protuberant and wan-

Fig. 2. Shows outline of skin and partial removal.

Fig. 3. Shows fat removed and the upper and lower flap of the abdomen being approximated.

dling in gait, awkwardly balanced, and as a rule short of breath. She is incommoded in dressing and hampered in caring for her person. She finds the toilet of the lower part of her person distressingly difficult, and in the more marked cases she has not been able to see her lower abdomen or her thighs for years.

Ten years ago I operated on a monstrous abdominal wall (see Johns Hopkins Hospital Bulletin, Oct., 1899), taking off from it a wedge of fat and skin extending from one flank across into the other, down to the deep fascia, much as one would cut a huge slice lengthwise out of a watermelon. The mass was so long that as I held one end up high in my hands at breast level, the other end dragged on the floor, and it was so heavy that it was difficult to keep my hold. The patient, who had diabetes, recovered from the operation, and was vastly relieved in every way by the loss of the pendulous abdomen and with it the disappearance of her hippopotomal appearance. In place of the unwieldy, flabby, overhanging mass, she had from the time of the operation a flat "straight front" abdomen with a long, linear scar from side to side, and looked as though some surgeon tried to saw her in half and had stopped when he got two-thirds of the way through. When the fat patient, as is often the case, has an umbilical hernia, the wide excision of the fat may be made to include this, facilitating the hernial operation by laying bare the deep fascia which is to be loosened from one semilunar line to the other and overlapped to cure the hernia.

It is easy to see how much tissue ought to be removed by pulling the mass up and away from the body. An incision above and below on the pendulous mass made a little above the lines of deflection will remove enough and yet leave enough skin for approximation.

With a little practice the surgeon will be able to decide this with his eye as the patient lies on her back on the table, or if he is uncertain he may cut across the abdomen below from side to side and then cautiously carry the upper incision from side to side, measuring with the eye and testing the mobility of the tissues above to see that they will slide down to meet the lower flap. This dissection can be made very rapidly. All hæmorrhage must be checked; deep vessels must be caught as they come out of the fascia and ligated with catgut. The incision must be carefully covered with hot gauzes while operating, and the incision sloped a little inwards so that apposition will be perfect.

All vessels are tied with fine catgut; the fat sewn together with catgut and the skin with silkworm gut and horsehair. At either end of the incision a small cigarette drain of rubber protective tissue is inserted. The dressing is with silver foil and sterile gauze.

These wounds, in spite of their immense size, heal promptly, and there is practically no post-operative discomfort. I sometimes,

Fig. 4. Shows abdomen sutured after removal of fat. The gauze drain in angle is clearly visible.

after getting a patient up in two weeks, require them to wear a bandage for several weeks more.

The results of such an operation are: The removal of a large slab of fat and a decrease in weight. Great addition to personal comfort generally. Convenience and comfort in dressing. Better pose in standing and better poise in walking. Increased activity. Cleanliness greatly facilitated. Figure changed from unsightly and awkward to one much more natural. The sensitive patient occupying afterwards a more normal and natural relation to society.

All these factors in her favor may in some cases serve to bring about such a change in enjoyment and activity of life that the patient seems rejuvenated. Quite apart, however, from the tremendous physical and, in some cases psychical benefit, I personally recommend

Fig. 5. Shows appearance of patient after operation.

and would do the operation in extreme cases for the cosmetic effect.

Since my original publication I can find no other reference in the literature to this subject except that of Weinhold in the Central. f. Gyn. No. 38, Sept. 18, 1909, p. 1332. He reports operating on a patient with enormously fat abdomen and an umbilical hernia. He goes extensively into the questions of plastic operations on the abdominal walls in conjunction with abdominal operations. His technique differs radically from mine. I find nowhere a deliberate operation for fat alone. Since my original case, I have had seven others, three in association with umbilical hernias, four alone. All cases have been immensely relieved.

INFLAMMATORY TUMORS OF THE SIGMOID

By MAX W. MYER, M. D., St. Louis, Missouri

WE frequently encounter in the surgery of the gastro-intestinal tract inflammatory tumors, which even upon inspection cannot be differentiated from malignant growths. This condition is especially frequent in dealing with lesions of the stomach. Similar inflammatory tumors are observed in the small and large bowel and offer even greater difficulties in their recognition and differentiation. The sigmoid seems comparatively free of this type of growth and it is the rarity of the condition, together with the difficulties which it offers, which warrants the reporting of this case.

Fig. 1. Tumor of sigmoid.

Tumors secondary to carcinoma of the sigmoid and those diffuse tumors secondary to diverticulitis are not included in this report. Neither are those inflammatory masses produced by mesosigmoiditis nor those secondary to specific infection to be discussed. The type of tumor which is here described is the primary, circumscript, inflammatory tumor of the sigmoid, benign in its pathological findings, but demanding as a rule radical treatment on account of the group of symptoms which develop.

Mrs. B., age 50 years, was admitted to the Parker Memorial Hospital at Columbia, Mo., on August 4, 1908, on account of a profuse vaginal hæmorrhage and purulent discharge, which had existed for several months.

The family history did not offer anything of interest.

The personal history was negative, except for a spell of typhoid twenty years ago.

The patient had five children, two of whom are living and healthy. The menstrual life was normal, the menopause having been reached at 43 years.

About five years ago, the patient complained of severe pain in the left inguinal region. For this trouble she claimed to have undergone an operation four years ago. The nature of this operation was not known to the patient and no scar could be found. Since April last, she had had a great deal of pain in the left side and had noticed a bloody discharge from the vagina. These symptoms had grown constantly worse. In the past month she had suffered from very severe constipation. At times the passing of gas and the stools were very painful. There had been a marked loss of weight in recent months and a daily loss of strength. The patient was very anæmic and somewhat cachectic, although she still had a very heavy fat polster.

The thorax and abdomen were negative. Vaginal examination revealed an atrophic vagina. A thin, watery, hæmorrhagic discharge with a very foul odor escaped from the vagina upon inserting the examining finger. The vaginal portion of the cervix was normal. The body of the uterus was retroflexed, large and of irregular contour. This entire mass was very sensitive to pressure and fixed in the hollow of the sacrum. The mass extended much farther to the left than right side, but could not be definitely outlined.

Upon introducing a sound into the cervical canal a very profuse hæmorrhage appeared. Curette removed a small mass of tissue, which the microscopic examination demonstrated to be carcinoma.

By rectal examination the mass could be much better palpated, and seemed firmly fixed. It extended to the left pelvic wall. No relation with the bowel could be detected by digital examination.

Diagnosis. Carcinoma of the cervical canal. Inflammatory involvement of the adnexa, with adhesions to the neighboring viscera.

Operation. Median incision, five inch fat polster and very heavy omentum. A bilateral hydrosalpinx with firm adhesions was encountered. At one point the small bowel was firmly attached and its walls somewhat thickened by inflammatory infiltration. The uterus was firmly fixed in the hollow of the sacrum. A Wertheim operation was done with great difficulty on account of the adhesions and the infiltration of the parametrium on both sides. Some hæmorrhage. After the removal of the uterus and appendages a mass about the size of a fist was detected in the sigmoid. This was regarded as malignant and was treated according to Mickulicz — the bowel being resected after forty-eight hours.

After a rather stormy twenty-four hours, the patient's condition improved and was satisfactory up to the sixth day, when she developed symptoms of peri-

Fig. 2. Cross-section of tumor mass.

tonitis and died on the eighth day. Autopsy was not permitted.

The uterine tumor was a typical carcinoma of the cervical canal, with marked infiltration of the parametrium.

Description of tumor of the sigmoid. The tumor mass the size of a fist has developed from the sigmoid (Fig. 1). It is of a rather hard elastic consistency. Several small epiploica are present. The surface shows a large increase in tissue, which can macroscopically be recognized as fat tissue. The normal bowel surface shows in only a very small area, the remainder being completely covered by the hypertrophic fat tissue. The greatest increase of tissue is on the mesenteric border.

Cross section shows the lumen of the bowel, very markedly constricted (Fig. 2). The different layers of the bowel can be readily recognized microscopically and are appreciably increased in thickness. In great part the entire bowel is surrounded by the hypertrophic tissue and especially noticeable is the increase on the mesenteric side. At several points on section, the epiploica seem to have taken active part in the process.

Microscopic examination. Sections were taken from the entire cut surface of the tumor. The mucous membrane appears normal throughout the entire lumen of the bowel. The glands are normal and do not penetrate the submucosa or muscularis at any point. The submucosa is markedly thickened, in great part due to œdema, but also some tissue increase. The muscularis is not appreciably thickened. The inner circular layer appears perfectly normal, while the outer longitudinal layer is here and there separated into bundles by the infiltrating fat tissue.

The connective tissue and fat tissue, which form the greater part of the tumor, have developed between the muscularis and the peritoneal covering of the bowel. On the outer surface of the tumor, the peritoneal layer is distinctly seen and shows a thickening due to an excessive inflammatory reaction. The connective tissue in great part does not show an excessive cellular development or vascularity, but seems to form merely a frame work for the very excessive fat development. At several points, however, a very active round cell infiltration is present. This seems to correspond to an area in the middle of the tumor mass. Several lymph nodes, showing an increased inflammatory reaction, are seen in the area corresponding to the thickening in the region of the mesentery. Neither necrosis nor degeneration are present. At no point is the slightest suspicion of malignancy encountered.

Only a few cases of this inflammatory type of tumor have been reported. Braun in a recent article reports such a case, together with inflammatory tumors of the other parts of the intestinal tract. Moynihan and Mayo Robson have both encountered such conditions and special emphasis is made by them of the difficulties in recognizing these growths. Monserrat has had opportunity to observe two cases. In the discussion of diverticulitis by Mayo and Giffin, one of the cases reported may possibly belong to this class. A careful search of the literature would no doubt reveal other cases, which a strict interpretation would place in this group.

The etiology is not always clear. The inflammatory process involves chiefly the connective tissue and fat layers, — at least in those tumors of the large bowel. The source of infection is manifold — coming either from within the lumen of the bowel or from without. Stagnation of fæces must be a frequent etiological factor, but adhesions to the neighboring viscera cannot be disregarded. It is possible that in the case reported the process in the adnexa was the original source of infection. A number of writers have attempted to establish a direct relation through the blood and lymph supply of the female genitals and the sigmoid. Such a relation is not necessary to explain this type of tumor. The presence of the uterine tumor in this case, however, influenced to a great degree the ready acceptance of the diagnosis of carcinoma of the sigmoid. Giffin has made the observation that diverticulitis of the sigmoid is found chiefly in the very fat. This should also be kept in mind in the consideration of the etiology of this inflammatory type.

It will not be possible to diagnose these tumors until a definite symptom-complex has been determined. Practically all tumors of this class which have been reported have been resected with a diagnosis of malignancy and the error recognized only after a careful microscopic examination. This may account for some of the good results in the reported cases of carcinoma of the sigmoid and especially those in which a permanent recovery is reported after a simple colostomy.

We are not accustomed in this class of tumor to find blood and pus present in the stools, at least not in those cases uncomplicated by ulceration. Naturally the presence of blood due to fissures and hæmorrhoids must be excluded. The obstructive symptoms develop slowly and after the patient has had an acute attack with the usual symptoms of a mild peritonitis in the left inguinal region, the process may clear up entirely to return again

with an exactly similar attack. In malignancy the obstructive symptoms are present more or less constantly after they once develop, and we do not have the periods of comparative freedom from symptoms. This is to be explained by the different causes of the obstructions, the malignant type being due to the obstruction from the tumor mass itself, while in the inflammatory an acute swelling causes the temporary closure. The length of time which such a group of symptoms has existed must be an important factor in the diagnosis. One must not be unmindful, however, of the fact that malignant tumors of this region are slow in development. Braun claims that cachexia may develop even in these inflammatory tumors, when the obstruction has been severe enough and of a sufficiently long duration to permit absorption of the toxins. The physical examination will sometimes reveal a small tumor mass in the region of the sigmoid. These are as a rule movable and cause very little if any pain upon manipulation. The inflammatory tumor is usually smaller than the malignant one, especially in the latter stages when a threatening perforation exists and the so-called conglomerate tumor develops, due to the formation of protective adhesions by the omentum.

In the female the tumor can sometimes be palpated vaginally in the posterior fornix and especially is this true of the malignant tumor.

The rectal examination is usually negative. The sigmoidoscope might be of advantage in some cases in making a differential diagnosis.

It has been impossible in the discussion of the symptoms of this tumor, not to deal with the differential diagnosis. Carcinoma of the sigmoid offers the greatest difficulty and will in most cases defy differentiation. Chronic diverticulitis with its group of symptoms, similar in great part to the inflammatory type, will also offer difficulties. The diverticulitis occurs, however, with far greater frequency. Spastic sigmoid and mesosigmoiditis must also be kept in mind. Differentiation from tumors of the genital tract in the female will also warrant consideration. This offers more difficulties in carcinoma than in the type of case reported. Bonney reports five cases in which a diagnosis of tumors of the genitals was made and at operation the sigmoid was the part involved. The writer has encountered such a case in which a diagnosis of an infected ovarian cyst was made, and at operation a carcinomatous ulcer of the sigmoid with perforation and development of an intra-abdominal abscess was found. The patient has remained well for over three years, following resection of the bowel and drainage.

The prognosis in the inflammatory type is good. They rarely grow to be much larger than the fist, for by this time, they have usually caused obstructive symptoms and demand treatment.

They do not tend to perforate forming an intraperitoneal abscess. Braun reports two cases in which he claims the tumor disappeared without operative treatment. Spastic sigmoid must be carefully differentiated before such cases are reported. Colostomy with rest has undoubtedly caused the disappearance of some of these tumors. Resection of the tumor will usually insure a cure, but Braun reports one case in which he had to do a second resection and found a tumor similar in every detail to the one removed at the first operation.

The treatment of these cases must remain operative unless a sufficiently definite group of symptoms can be developed by which a differential diagnosis from malignancy can be made. Palliative treatment is not indicated on account of losing valuable time, should the tumor prove to be a malignant one. Resection always becomes necessary after obstructive symptoms develop. Primary resection with end to end or lateral anastomosis is the operation of choice, unless an acute obstruction makes such a resection dangerous or impossible. In such cases the Mickulicz operation is indicated. In the case reported this operation was done because the patient was not in a condition to withstand a resection after the Wertheim operation. Temporary colostomy having as its ultimate aim the disappearance of the tumor would hardly be justifiable even though a positive diagnosis of a circumscript inflammatory tumor could be made.

CIRCUMSCRIBED SEROUS MENINGITIS OF THE CORD[1]

By JOHN C. MUNRO, M. D.
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AN interesting paper on this subject, by Spiller, that appeared in the American Journal of the Medical Sciences for January, 1909, explained a condition which I had observed a number of times at operation, and for which I had previously obtained no satisfactory explanation. At the time of my earlier cases (1897) I reported the findings to pathologists, who not only gave me no light on the subject but even questioned the existence of the lesion. In a small collection of cases of laminectomy, reported at the American Medical Association in 1904, I called attention to one with syringomyelia and to another diagnosticated as subacute fracture dislocation, in which I found a "collection of clear fluid under a distinct arachnoid membrane" in which "the removal of this fluid produced marked amelioration in the pressure symptoms." This phenomenon and the relief that followed the removal of a soft extradural myeloma in another case led me to say that "there is a something that produces grave paralysis that is demonstrated clinically, which appears totally inadequate and for which we have no corresponding experimental nor post-mortem explanation."

That the lesion had been observed by Krause and a few others was unknown to me at the time. A clinical lecture by Horsley, appearing soon after Spiller's paper, has stimulated me to report my own cases in detail and to examine the scant literature upon the subject in the hope of arousing surgical interest in a class of patients that otherwise would be condemned to a slow, inevitable, and distressing death.

Von Bruns, in 1908, said that "in more recent times operation has shown that there is a form of disease difficult of interpretation but which can mimic in a most classical manner tumors of the dura: a meningitis serosa circumscripta." In February, 1909, in a most valuable clinical lecture published in the British Medical Journal, based on an experience with twenty-one cases of this type — valuable because it gives general conclusions founded on a broad experience and because it is not a tedious analysis of cases — Horsley says that "many cases of so-called acute myelitis are meningeal in origin and a laminectomy may arrest the whole process and later injury to the cord."

The disease, when it comes to operation, is almost invariably considered to be tumor. At present there seems to be no sharp line in diagnosis between the various types of subdural lesions, but greater familiarity with the signs and symptoms of serous meningitis will probably enable the diagnostician to detect it with reasonable accuracy.

No writer has reported a large experience with this form of lesion. As mentioned above, Horsley has seen twenty-one cases, Krause, in 1907, reported six out of twenty-two operations for supposed tumor. Other writers (Oppenheim, v. Bruns, Mendel and Adler, de Montet, etc.) report one or two cases each.

The lesion is found more frequently in the middle decades of life. Horsley had one patient under the age of puberty, v. Bruns one sixteen years old, and my youngest patient was fourteen. Horsley's oldest patient was sixty.

The earliest mention of this type of disease that I have found is by Schlesinger, who reported in 1898 a case of hydrops meningeus dying from intercurrent disease, in which he found an intradural cyst adherent to the dura and compressing the cord. The symptoms were typical as we know them now. Undoubtedly other cases had been reported earlier than Schlesinger's but the important point is that the significance of the lesion was not properly recognized until about 1900, by Horsley, Krause, and a few others.

The case reported in 1903 by Spiller, Musser, and Martin is the first one mentioned in American literature so far as I can discover.

The pathology has been demonstrated better

[1] Read at the Meeting of the Southern Surgical and Gynecological Association, December 15, 1909.

in the living than in the dead. But few autopsies are recorded and then rarely in connection with the symptoms. Schmorl demonstrated a middorsal cyst removed post-mortem, full of fluid and compressing the cord. Of two fatal cases mentioned by Horsley in neither were the nerve roots much affected, "so that it is easy to understand that there may be independent paraplegia and yet no absolute anæsthesia anywhere." One of his cases died of cardiac syphilis and the other, unoperated, died of a meningo-gliosis(sclerosis).

In typical cases one finds at operation a tense dura, probably not pulsating. When this is opened a small quantity of cerebrospinal fluid escapes under slight pressure, while immediately the dural slit is filled by a thin, more or less opaque pial membrane that bulges forth under tension of the contained fluid. This fluid is clear and spurts forth as soon as the membrane is opened, when the latter flaps back and forth as a definite curtain, attached to the dura and cord and more or less to the nerve roots. This membrane can be dissected out in great part, as in one of my cases, or it may be removed intact without being opened, as in Schmidt's case, when it appeared as a sausage-shaped cyst 7½ by 1½ cm., with blunt boss-like projections. The wall in his case was found to consist of dense connective tissue lined on the inner surface with a single layer of flattened epithelium. The membrane has been described as similar to the loose subcutaneous tissue that forms in Schleich's infiltration anæsthesia, a "milk-like opacity," as it were.

In a few reported cases this definite membrane formation has not existed as such or else has been overlooked. In all of my cases it was distinctively present. When not reported or not identified there seems to be a localized collection of fluid under abnormal pressure. De Montet examined the fluid and found only lymphocytes and leucocytes and some large mononuclear cells like large phagocytes. He found no plasma cells nor bacteria. The cerebrospinal fluid drawn by lumbar puncture from case 1 of my series was sterile.

The extent of adhesions apparently varies and it is not always clear why the fluid tension should be so localized. In some cases a probe can be passed beneath the pia in one direction without obstruction, while in the opposite direction it is blocked by light adhesions. In other instances a true cyst is found. The cord is reported as flattened in some while in others it is not obviously narrowed.

No causation, definite and common to all cases is known. A case reported by Oppenheim and operated upon by Lexer and one of v. Bruns' cases was secondary possibly to a spinal caries. Mendel and Adler's patient had well marked apical tuberculosis. Syphilis has been present in several cases, including one and possibly two of my own. In this respect it is important to bear in mind that in no case of this sort has anti-syphilitic treatment been of any value; rather has it been harmful. In the post-mortem examination of a syphilitic case by Schwartz there was found diffuse cervical and dorsal meningitis with adhesions of the dura, degeneration of the cord, and destruction of the posterior roots. The anterior columns were compressed by a meningeal cyst. In the anterior horns were cavities without gliosis.

Ströbe showed a post-mortem specimen of serous meningitis in a case dying of chronic leptomeningitis. He suggests some inflammation in the cord, meninges or bony spine, or a gliosis as a cause. Furthermore, an extensive degeneration of the columns or a syphilitic meningitis may serve as a primary cause. At the autopsy of my case dying of operative septic meningitis no primary cause could be found for the serous meningitis.

In several cases, among them that of v. Bruns, no local or general cause could be demonstrated; Schlesinger found a serous cyst in a case dying of multiple cerebrospinal sclerosis, and the lesion has been found in a patient dying of typhus (spotted fever).

Krause has reported at great length a case following gunshot wound of the spine, with subsequent necrosis and abscess. Unfortunately he did not open the dura sufficiently to demonstrate the pial membrane and the case, in spite of his findings, is not thoroughly convincing. To be sure, he punctured the very thick opaque dura, evacuating clear fluid under abnormal pressure, but relief to symptoms had already followed evacuation of an epidural

abscess, much as I have seen follow the evacuation of a soft myeloma pressing or rather resting on the outer surface of the dura. On the other hand, a strong argument that a neighboring infection may act as a cause is seen in the localized serous cerebral meningitis secondary to middle ear infection (Quincke) and which clears up as soon as the primary cause is eliminated.

Serous meningitis may be found in glioma and syringomyelia whatever the interrelation of the two conditions may be.

Horsley speaks of influenza as a cause, and de Montet's case followed a bad cold (coryza). The former also mentions the fact that a gonorrhœa occurred relatively near the onset of symptoms in some of his cases.

That trauma, with and without serious damage to the cord, may be an exciting cause is shown in Bliss' case and in two of my cases. Oppenheim says, however, that serous meningitis of this type is not a sequela to concussion or to railway spine.

Joachim believes that the condition may be primary in the pia, as shown in a post-mortem examination where there was thickening of the pia and of the dura, the latter apparently being secondary. Krause maintains that "disease of the arachnoid leads not only to the formation of adhesions and increased exudation, but the power of absorption at the diseased area, if not wholly impaired, is at least diminished."

Finally, whatever the cause or causes may be, it is important for us to remember that conditions of this sort do exist; that they closely imitate the conditions produced by tumor and that the outlook under early surgical interference is good, while the outlook under a policy of non-interference is fatal.

The results from operation, where no grave primary lesion exists, are very good. Improvement may be relatively rapid or quite slow, according to the duration of the lesion and the extent of the damage inflicted upon the cord and nerve roots. Recovery may be aided by electricity, massage, and passive motion, as emphatically demonstrated in one of my cases. Spiller, Musser, and Martin's case was well in two months after operation, Mendel and Adler's in five months, while a case of v. Bruns, with returning function two weeks from operation, required twenty months to bring about recovery that was almost complete.

Oppenheim reports a case dying on the table from the shock of a long operation, and one of my cases died within a few days from operative septic meningitis.

A patient of Horsley's, operated upon in 1899, is well now. My cases operated upon in 1902 and 1906, both without attendant deep lesion of the cord, are well at the present time.

With recovery certain minor symptoms or signs may persist without impairing the patient's usefulness. Such are localized atrophies, increased reflexes, lack of complete joint extension, etc.

There seems to be but little reaction from operation in the average case. Spiller, Musser, and Martin's case exhibited clonic spasms upon evacuation of the subpial fluid. A similar phenomenon I have not seen reported elsewhere, nor have I encountered it in any of my own spinal work. All authorities agree that spontaneous recovery does not take place, and Horsley is convinced that he has not infrequently found a localized meningitis as the essential if not the sole cause of the paralytic symptoms.

A sufficient number of cases have not been reported to enable me to venture upon the question of differential diagnosis. To quote briefly some neurological authorities will be sufficient here. Oppenheim states that in gliosis we find wanting the cramp-like muscular spasms which are so frequent in tumor, and which appear so early in pressure of the cord. In syringomyelia we look for trophic disturbances in the bones and joints with bowing of the spine and a slow dragging course with remissions. According to Joachim, "decision on the differentiation between tumor and an inflammatory process depends whether we can establish a propagation of the process upwards." Horsley speaks of the unilateral origin in most cases, a condition that must be recognized at the outset.

It will be well to take up the symptoms individually as recorded by the various reporters.

Pain. This symptom is practically always present. It may affect the back, the neck, the scapula, or the extremities. It may shoot into

the breasts or may appear lower down in the trunk as a typical girdle pain. All patients, however, do not complain of the latter, and exceptionally when present it will be increased on coughing or be relieved on change of position. Pain often starts and is treated as a lumbago. One patient complained of unilateral pain in the penis and scrotum at coitus.

When in the extremities it is described as tearing, burning, or crawling, and, according to Horsley, it is in the limb-substance itself. One of my cases described his sensations as though his thighs were immersed in boiling oil.

Horsley calls attention to the diffuse area of pain as an important diagnostic guide, the pain area in tumor being referred rather to one nerve root.

Paralysis and paresis. Paralysis often begins as a weakness of the lower extremities, or a weakness and stiffness that is unequal on the two sides. Some patients, with scarcely any premonitory symptoms, suddenly fall down while walking or rising from a chair, and from that time become more or less paraplegic. Spasticity generally coexists, often appears early, and patients will exhibit a paretic ataxic gait. A light form of unilateral paresis may be found or a paraplegia or paraparesis may be complete, except in one toe or a foot. As in one of my cases, the paralysis may be spastic at one time and flaccid at others.

Incontinence of the urine and fæces, singly or combined, may or may not be present. Loss of power in emptying the bladder or rectum may be due to a paralysis of the abdominal muscles. When the lesion is in the upper spine the upper extremities may suffer more or less paralysis. In my third case the paralysis of the upper extremity was associated with marked atrophy, while a corresponding degree of atrophy did not exist in the paralyzed lower limbs. The dorsal spine seems to be the region most frequently involved, however.

Spasmodic involuntary muscular spasm is frequently seen and it may be worse at night. A spasm may be precipitated by light stroking or rubbing of the skin and sometimes it affects the flexor, sometimes the extensor muscles. In one of my cases the adductor spasm of the thighs was so great that it was almost impossible to separate the knees by main force.

The *reflex phenomena* vary very much in individuals. They may be normal, absent, or generally increased. At times a Babinski will be present on one or both sides, sometimes absent on both sides, or it may fluctuate in the same individual. Patellar clonus may be present on one or both sides while the ankle clonus is absent. In case 1 of my series the ankle clonus was present on one side, slight on the other, while the knee jerks were increased on both sides, while in case 4, in which there was complete anæsthesia, the knee jerks were present but the ankle clonus and plantar reflexes were absent.

In case 6 the knee jerk and the ankle clonus were exaggerated on one side and absent on the opposite side. The Achilles reflex may be absent or present. So with the abdominal reflexes. In short, the presence or absence of the various reflexes varies greatly, judging from the reported cases, and individually the different signs may vary during the progress of the disease.

Sensation. We may find normal sensation; anæsthesia of the involved area; anæsthesia of one area, such as the trunk; and hyperæsthesia of another area, as the lower extremities. Anæsthesia may be present but irregularly distributed on the two sides. Horsley states that anæsthesia may be absolute, always relative, and sometimes only slight, though distributed over a large area. He also points to the parallelism that exists between tactile anæsthesia and the deficiency of the secretory system, shown by administration of pilocarpine.

Patients often complain of numbness as one of the earliest symptoms, appearing about the same time as the initial weakness or paraparesis. Hypalgesia may be followed by hypanæsthesia and thermal hypæsthesia may be found.

A sharply defined border of sensation may change from time to time, and de Montet states that the behavior of sensation at different examinations is possibly characteristic of the disease. "Hyperæsthesia over a large area speaks against tumor where there may be a marked zone at the upper limit of anæsthesia or an area corresponding to the nerve-root or roots on which the tumor is situated." (Horsley.)

Occasionally there is hypersensation in some localized area. Trophic lesions are absent and atrophy may be. Two of my cases with trophic lesions had deep lesions of the cord (glioma or crush).

Myosis, astereognosis, irregular temperature (Schmidt), and coitus without ejaculation are rarely present. Horsley has seen herpes but once. Vasomotor symptoms are absent.

We may find tenderness on pressure over one or more spinous processes, but this tenderness is not increased on motion.

The onset of symptoms may be short or long (three and a half years in Joachim's case and almost nine years in my case 5), and any patient may exhibit an abeyance of symptoms for quite a period.

There is no way to estimate except roughly the time that elapses between the onset of the primary cause and the formation of the pial membrane. In my case of longest onset, nine years, the membrane may have existed from the beginning or it may have formed about two years before operation when the acute symptoms arose. On the other hand, the membrane was definitely formed, at the longest, sixteen days after the causative trauma in case 4, while in case 3 (traumatic) it could have formed nine weeks before operation.

There is no evidence that family history has any bearing on the disease.

Treatment consists in early laminectomy. Nearly every writer condemns lumbar or local puncture as a therapeutic measure or even as an aid to diagnosis except negatively. Early operation would probably relieve most if not all cases suffering from serous meningitis. Mere evacuation of the subpial fluid with or without excision of the pial membrane, with or without drainage, has brought relief in one case or another. Horsley irrigates the canal with bichloride solution, exceptionally using a solution as strong as 1 to 1,000 or 1 to 500. He closes the wound without external drainage and after healing advises mercurial inunction over the wound area as an absorbent. Whether this is always necessary is doubtful; it however can do no harm.

A very brief consideration of my cases is in order before concluding.

Case 1, as autopsy showed, was one of glioma and syringomyelia, there being a dilated central cavity in addition to local lateral cavities in the cord. The abscesses in the cord were evidently secondary to the bed-sores. The latter probably accounted for the chills and irregular temperature. In spite of the fatal central lesions I think it fair to assume that some benefit followed evacuation of the local collection of serum.

Case 2 was clinically diagnosticated as syringomyelia, but in the absence of trophic and joint manifestations I am inclined to the diagnosis of glioma. It is unfortunate that at the second operation I did not open the canal above rather than below the original opening. I believe more relief would have been obtained thereby.

Case 3 demonstrates that a serous meningitis may be secondary to trauma. In view of his recovery, which was complete except for slight atrophy of the forearm, I think it fair to assume that there was no serious cord injury at any time, while case 4 demonstrates that an irreparable crush of the cord may co-exist and will prevent a complete recovery after operation for a serous meningitis.

Case 5 was most unfortunate in every way. Had he not been infected at operation there is every reason to believe that recovery would have been complete. In searching for the origin of this and other cases of infection in our clinic at that time, we found that the 70 per cent alcohol used in disinfecting the operative field and the hands, taken from the original container, gave positive cultures. Since then we have discarded alcohol in our preparations.

Case 6 has been a most satisfactory one when his paralytic condition is considered, but his final recovery must be credited in great part to the tireless after treatment. I could not explain the profuse hæmorrhage that took place at the first operation. No pial nor dural vessels were injured; the hæmorrhage seemed at the time to come as a result of sudden relief of tension, as is occasionally seen in the abdomen and other cavities tensely distended.

CASE 1. Robert McV., 32 years old, entered Dr. G. W. Gay's service at the Boston City Hospital on November 12, 1897. The history is as follows:

Gonorrhœa nine years ago. Denies syphilis. Moderate use of alcohol. Was strong and healthy up to one year ago when he began to have neuralgic pains in

his head and shoulders lasting for ten weeks and then moving downwards to the middle of the back. The pain was constant, but worse at night, sharp and spasmodic at times or dull and aching. He had girdle pain and complained of formication and numbness in his feet and legs. At first he walked with a cane, later with crutches, and finally, two months before entrance, he became bedridden.

For six months there had been dribbling of urine and some fæcal incontinence. At entrance there was no control over bladder or rectum, and the paralysis of the lower limbs was nearly complete.

Dr. W. N. Bullard examined him at this time and made the following notes.

Diminished sensation below the fifth interspace in mammary line reaching back to the sixth on the right and the eighth on the left. Diminished sensation in lower extremities. Subjective numbness in both legs, ankle clonus present on the left, slight on the right, knee jerks increased.

In addition it was noted that there was general weakness of both lower extremities without absolute paralysis except in dorsal flexion of the left foot. No muscular spasm. Slight patellar clonus on right side. Plantar reflexes good; cremasteric reflexes present but diminished. Abdominal and epigastric reflexes absent. Pupils equal and reacting to light and accommodation. Arm reflexes not increased.

Lumbar puncture gave sterile fluid. Smears negative.

A few days later Dr. Bullard made a second examination and reported that the sensation to touch and pain about the level of the fifth ribs on the mammary line and at the sixth dorsal spine was diminished about equally on both sides. This diminution in sensation involved the entire trunk where it was well marked. Sensation reappeared at the right groin and somewhat over the entire right lower extremity though it was probably somewhat diminished in places over the right leg. In the left lower extremity sensation was markedly diminished over the patella and along the crest of the tibia, and apparently somewhat so along the inner surface of the thigh and leg. On the whole it was less good in the left than in the right though over both lower extremities it was apparently delayed and the patient did not always know how to answer.

Operation was arranged for November 29th, but the patient became suddenly ill with chill and high temperature, rapid pulse and vomiting. On November 30th I operated, my notes stating that at the time there was cystitis, bed-sores, and that he had had occasional chills for some time.

Under ether I removed the fourth to seventh dorsal laminæ, inclusive, and opened the dura the entire length of this space. At first there was escape of considerable clear fluid. The dorsal vein of the cord appeared a little more distended than normal. In the lower half of the incision there was a thin, opaque, white film apparently in the pia and slightly adherent to both the cord and to the under surface of the dura. A probe passed in all directions failed to disclose any tumor. The upper three-fourths of the dura was closed with catgut and the external wound closed with silkworm gut, allowing for a temporary rubber tissue drain at the lower angle. The wound was previously flushed out with bichloride solution and salt solution. There was no shock.

December 2. Patient not as well as on first day, both temperature and pulse being elevated.

December 4. Stitch abscess. Stitches removed. Bed-sores over sacrum and left trochanter. Patient feels a puckering sensation in skin of legs below knees. Has gained control of the bladder. Some subjective improvement in motion and sensation of legs.

December 8. Worse. Much pain, requiring morphine. Has chills and most exhausting sweats. Is very weak. Wound looks well.

December 16. Improvement lately. Wound clean.

December 23. Much improved. Has very little pain and can move his toes a little.

January 2. Very comfortable. No pain. Has been on an air bed and the bed-sores are better.

January 12. Chilly sensations with temperature varying from 100° to 105°.

January 20. About the same. After this he rapidly grew worse and died January 29th. At autopsy only the spine was allowed to be opened. Report by Dr. F. B. Mallory. After describing the wound and external parts it says: Spinal canal completely filled by distended dura. On slitting up the dura in situ the cord was found to be enlarged and closely applied to the dura which was adherent to it over the dorsal and lumbar regions. The pia in this part of the cord much thickened, fibrous, and œdematous. The enlargement of the cord began about seven cm. above the cauda equina and extended upwards as far as the cord could be removed in the cervical region. Section of the cord in the cervical region showed two cavities each several cm. in diameter, occupying apparently that part of the cord where the gray matter ordinarily belongs. At the lower end of the cord there seemed to be swelling and œdema around the central canal for an area of 2 or 3 mm. The cord was hardened, and numerous sections were made, the concluding diagnosis being syringomyelia, glioma, and streptoccocic abscess of cord.

CASE 2. Charles A. B., astronomer, 27 years old, was seen in consultation with Dr. B. Tenny and Dr. W. N. Bullard on July 29, 1898. Patient first noticed weakness in his lower extremities about two years before the time of my visit. As the weakness increased he was obliged to use crutches, but for the last year paralysis had been nearly complete. He suffered intense pain, describing it as though his thighs were immersed in boiling oil. He had taken morphine regularly for this pain.

Dr. Bullard's notes on examination are as follows: Spinal muscles in lower back tense. The seventh dorsal spine is tender to pressure at times. Knee jerks much increased. Ankle clonus marked on both sides. Paraplegia of both lower extremities, though he can stand with the help of a chair. Sensation to touch and pain is not impaired. Heat and cold not felt well below the level of about the seventh nerve. Galvanic

sensation is diminished at a little higher level (fifth or sixth nerve in front and back). No reaction of flexor cruris to galvanism. All superficial reflexes of abdomen and cremasteric reflex absent. Plantar reflex not tested on account of the spasm.

Diagnosis of tumor of cord in upper dorsal region or of syringomyelia was made.

On August 3d I operated, and found the sixth and seventh dorsal laminæ quite hard and ivory-like, no opening between the two being found. The fourth to seventh laminæ, inclusive, were removed. The dura appeared to be normal and on being opened a normal quantity of serum escaped. Pressing up through the opening was a translucent pial membrane, the pulsation of which and of the cord was less than normal. On opening this sac a large quantity of clear fluid spurted forth under considerable pressure and continued to flow until quite an amount escaped. As the fluid escaped pulsation of the cord returned, and the pial membrane floated back and forth on the wave of serum with respiration. In the pia on the left side were two veins in addition to that on the median line. The cord looked and felt normal. A probe carried upward and downward detected nothing abnormal. Fluid escaped both from the upper and lower ends. There was no evidence of pressure beneath the ankylosed laminæ. The dura was left open and a gauze drain carried outward at the lower angle of the wound, which was closed with silkworm gut.

During the first night the patient was quite uncomfortable, but the pain in the lower extremities, except at the ankle, began to diminish and the spasms began to lessen. He emptied his bladder voluntarily, which he could not do before operation, and the girdle pain moved downwards about an inch.

Nine days after operation improvement continued in the way of less pain and the ability to sleep all night and to have long naps in the daytime without morphine, a thing that he had not been able to do for about two years. He could make use of his abdominal muscles in defecation, and the girdle sensation moved downwards.

He continued to improve, the improvement lasting for about five months, when the symptoms returned as bad as ever and in June of the following year (1899) he returned for reoperation, in the hopes of receiving temporary respite at least. He complained of constant sensitiveness in the lower sacral and coccygeal regions, the clonic spasms had returned, and the left arm and shoulder exhibited tingling pain at times. There were attacks of spasm in the spinal muscles and moderate spasm in the lower extremities.

He was seen by another neurologist at this time, who suspected a tumor at the conus, and with considerable hesitation I consented to operate at a lower level. I removed the two last dorsal and two upper lumbar laminæ and found a similar condition as at the first operation; a tense dura, through the opening of which bulged a distinct pial membrane full of fluid under pressure. No tumor of the cord or of the cauda equina was found. A probe could be passed upwards to the level of the scar without meeting any resistance. The dura was not sutured and the wound was closed with silkworm gut. The symptoms were benefited less by this operation, but his general condition improved somewhat.

CASE 3. Henry K., 14 years old, a professional acrobat slipped in turning a back somersault nine weeks before entrance to the Boston City Hospital, landing on the back of his neck. He rose immediately to his knees but was unable to rise any further, and since the accident he had been unable to walk. He remembered that he was positively unable to move his legs the day after the accident, and that he used his hands awkwardly while eating. He was taken to a hospital in Virginia and electricity was given. He had some pain at the seat of injury immediately after the accident but has had none since. He was catheterized after the injury and had incontinence since, but he had been able to control his rectum. He said that his forearms and hands had "grown thin." Temperature at admission 99°, pulse slightly irregular, 84. Examination of abdomen negative. He lay relaxed on his back in bed.

Dr. W. N. Bullard examined him, and his notes are as follows: Head, pupils, etc., normal. Upper extremity: Extreme atrophy of flexors of the forearm and less of the other muscles, though the atrophy is marked nevertheless. The hands are claw-shaped. All motions in the upper extremity are possible but very weak, except opposition and abduction of the thumbs. The wrist is extended on flexion of the fingers. Diminution of sensation is not marked over the left upper extremity; in the right upper extremity it is normal. Sensation is diminished below the iliac crests. Total paraplegia, but apparently no atrophy. Cremasteric reflexes present. Knee jerks increased, no clonus. Babinski present. Some rigidity of lower extremities on passive motion.

In addition to this the following notes are recorded: Stereognostic, pain, tactile and thermal sensation normal in hands, legs and forearms. Flexion and extension of forearms strong. Can not rise in bed without strong assistance. No obvious atrophy of the muscles of the back. Paralysis of the limbs is at times flaccid, at times spastic. There is a suggestion of Kernig's sign until the thigh has been held flexed for several seconds, and then the muscles relax, allowing complete extension of the lower leg on the flexed thigh. The skin is normal. There is no scoliosis.

On August 19th I removed the seventh cervical and first dorsal laminæ under ether. The dura was translucent, not pulsating. On being opened a small quantity of fluid escaped. Pressing against the dura was a pial sac containing much fluid under pressure. The pia was attached to the dura and laterally to the cord and nerve roots so that in freeing it fresh bleeding took place. The pia was freed within the reach of a probe. The pia and dura were not closed. The external wound was closed with silkworm gut, allowing for rubber tissue drain. No shock.

August 23. Has had a good deal of pain in the neck requiring morphine. Has been on a Bradford frame since operation.

August 27. Primary union. General condition improved.

August 31. Much improved. Can move head freely without pain. No control over legs.

September 4. Sitting up in bed.

September 14. Condition of arms improved. Can raise his body from a chair with his arms. No change in the paralysis of the legs.

September 18. Discharged to his home.

In May following operation, that is, nine months later, the boy ran to meet me on the street and all that I could find that he complained of was a slight atrophy of the back of one forearm. Since then I am told that he returned to his profession as an acrobat.

CASE 4. Michael J. D., 44 years old, fell May 6, 1903, from a load of leather, striking his head and shoulders on the pavement. He was paralyzed at once in his lower extremities and was taken to the Boston City Hospital Relief Station. Examination there showed equal pupils, complete anæsthesia below the nipples, knee jerk present on both sides, no ankle clonus, no plantar reflex, no bony deformity, distended abdomen, and an approach to priapism. He was later transferred to the main hospital and on the 10th it is recorded that the temperature had slowly risen to 100°, but the pulse remained slow. There was complete paralysis of the legs, thighs, forearms, and muscles of the abdomen. The anæsthesia remained as noted. The knee jerks and plantar reflexes were absent. Retention of urine.

May 14. Normal temperature. Pulse 60. Dr. P. C. Knapp saw him in consultation and made a diagnosis of crush of cord at first dorsal segment.

On May 22d I operated. Soon after starting anæsthesia the patient choked and became cyanotic, requiring artificial respiration for a few minutes. The sixth and seventh cervical laminæ were removed. In the muscles were evidences of old hæmorrhage and laceration. No fracture was found. On opening the dura a small amount of fluid escaped. Pushing up against the dura was a firm, pial membrane beneath which a large amount of clear fluid was contained. The cord appeared to be normal. The wound was closed, allowing for a temporary rubber tissue drain. No shock. On the afternoon of the operation the temperature rose to 102.4°, but soon dropped to normal. Considerable fluid drained out. Wound clean.

June 4. Temperature irregularly elevated recently. Beginning motion in forearms but no change in anæsthesia. Respiration shallow, apparently without use of intercostal muscles.

June 11. Incontinence. Can flex and extend forearms slowly but has no control of hands. Bed-sores beginning over sacrum.

June 16. Wound firmly healed. Incontinence of urine and fæces.

June 20. Necrosis in all prominent parts of body.

June 24. Worse. Delirious. Temperature rising, pulse 120.

July 6. Worse. Almost constant motion of both arms. Irregular temperature, bad pulse.

July 9. Died. No autopsy.

CASE 5. Edward C. B., 38 years old, entered the Carney Hospital on May 9, 1906. He had a primary lesion ten years before, followed by typical secondary manifestations for which he was carefully treated.

Dr. L. P. O'Donnell, assistant neurologist, examined him carefully and from his notes I quote freely. About nine years ago patient noticed slowly increasing weakness of his legs and undue fatigue after moderate exertion. He had been able, however, to attend to his work as a commercial traveler up to the present time, though for the last year and a half he had used a cane.

Two years ago there was a sudden onset of numbness and hemiplegia lasting for two or three days, but he does not recall which side was affected. For two years he has not had full control of his sphincters and for a year and a half he has used a catheter. During this time he has had a dull ache and feeling of weariness in the sacral and perineal regions. He has had no sharp pain or girdle sensation. Mentally he is clear.

He walks without ataxia, does not sway with his eyes open. Very slight Romberg is present. Cranial nerves and special senses normal. Pupils show slight myosis but react normally to light and accommodation. At a later examination the pupils were unequal, the left being dilated. Supinator and triceps reflexes are sharp, but within normal limits and equal on both sides.

Reflexes of the lower extremities are exaggerated. There is slight ankle clonus on both sides and Babinski on both sides. The muscles of the lower extremities are well nourished but spastic in a high degree. No disturbance of sensation to touch and pain. No line of hyperæsthesia. There is, however, a well marked zone of muscular and cutaneous irritability corresponding to the distribution of the lumbar and sacral nerves, and throughout this zone slight irritation of the skin or tapping of the muscles produces muscular contractions with a large degree of spasticity. The strength of the legs is not markedly diminished. There is tenderness, on pressure, over the spinous processes of the last dorsal and first lumbar vertebræ.

The diagnosis of a late syphilitic manifestation with cerebrospinal distribution in islets was made, with probably a well marked and localized meningomyelitis involving probably the first and second lumbar segments of the cord.

Operation May 15th under ether. The three lowest dorsal or two dorsal and first lumbar laminæ were removed. There was considerable hæmorrhage from large epidural veins, so much so that it was thought best to pack and delay opening the dura for forty-eight hours. Increased spastic contraction and pain from the packing, with rise of pulse and temperature followed this procedure, so, on May 17th, I opened the dura. Beneath it the pia was distended as a definite membrane, slightly opaque and thickened. Clear fluid was evacuated and the cord appeared normal without evidence of tumor or thickening. The posterior roots looked normal. Some of the pial membrane was removed and the dura was closed with catgut.

Exploration upwards and downwards inside the pia failed to show any tumor. The wound was closed

with silkworm gut, allowing for a capillary drain to the dura at the lower angle.

The patient reacted well from the operation but within twelve hours the pulse rose to 120, with nausea and vomiting. He spent a poor night, with increasing vomiting, a temperature of 105.5° and pulse 130. Lavage was tried but he rapidly failed and died about thirty-six hours after the second operation.

Autopsy showed septic meningitis in cervical region as cause of death. Sections of the cord showed no tumor, glioma, or other primary lesion.

CASE 6. Gilbert, N. S., aged 37, architect, was seen in consultation with Dr. Alice N. Gray and Dr. John Jenks Thomas in the latter part of July, 1906. In 1894 he had trouble with his right upper arm that was diagnosticated and treated as rheumatism for three years. An X-ray then showed it to be osteomyelitis and from that time until 1903 he had many operations, finally losing the arm at the shoulder joint.

In December, 1905, he began to suffer from severe "lumbago" pains, stiffness, and numbness of the lower extremities. While on jury duty at about this time he became greatly fatigued and one day while rising from a chair he fell suddenly, and from that time was practically bedridden.

Four or five months before I operated upon him he had a right middle ear abscess which cleared up without any after effects. Within a month or so after operation deafness started in the left ear and has slowly increased until now it is practically complete.

Dr. Thomas saw him shortly before my visit and he has kindly allowed me the use of the following notes. In December, 1904, the patient had pain in his hip and soon afterwards noticed that the right leg felt weak and that the knees would give way. While in bed the knees would flex.[1] Stooping caused pain and he had to give up work in December, 1905. He noticed that the right side of his body would sweat, but not the left side. In July, 1906, he had cramps in his legs with flexion and adduction. Numbness was less marked at this time than before. There was no trouble in controlling the bladder or the rectum, though he suffered from constipation, requiring a suppository daily. Examination showed the patient lying in the dorsal position with the thighs drawn up nearly to a right angle with the body and the legs acutely flexed on the thighs. The legs were in condition of spastic paralysis with marked adductor spasm which, however, relaxed at times. The spasmodic contractions were for the most part in the thigh muscles, particularly the adductors and recti femoris and in the abdominal muscles. Handling the muscles and passive movements of the legs brought on a spasm and practically there was no voluntary control over the lower extremities.

Sensation to touch, pain, and temperature was about normal in the feet and legs. In the thighs and abdomen the prick of a pin started up a muscular contraction. In the trunk, at the level of the eighth or ninth thoracic root, the prick of a pin was felt as a burning sensation.

[1] This was preceded by a period of spasmodic extension and scissors-like action.

The patellar reflexes could not be tested. There was double ankle clonus and Babinski's sign. The abdominal and epigastric reflexes could not be tested. Reaction of the leg muscles to the faradic current was good.

The lower thoracic region of the spine was rather rigid on passive motion while the movements of the lumbar spine were much better. There was slight diffuse tenderness to percussion in the lower thoracic region. No deformity of the spine.

In one of my own examinations I found the knee jerk increased on the right, slight or absent on the left, with a similar variation in the ankle clonus. There were no bed-sores. No history or evidence of syphilis.

At operation on August 2d, I removed, under ether, the sixth, seventh, and eighth dorsal laminæ and through a second incision removed the second lumbar lamina. The dura in the upper wound was opened and a considerable quantity of serum escaped under moderate pressure. This fluid was clear at first and then became more and more bloody, until finally there was a steady outpour of venous blood which apparently came from below the level of the incision and from between the dura and pia. The dura appeared thickened and opaque on the inner surface. The field could not be dried long enough to obtain a clear look at the cord. The dura in the lower incision was pricked, and serum, followed by blood, escaped. Both wounds were closed with silkworm gut, allowing for a capillary drain to the dura. He recovered well from this operation and in ten days the pain in the legs had ceased. By making an effort he could straighten the knees to about 130° and there was some general improvement with respect to the spasticity of the legs and abdomen. Otherwise he was the same as before operation and was discharged August 15th.

Two months later, October 8th, I again saw him with Dr. Gray and Dr. Thomas, and the latter's notes state that after the operation he could move better and had less spasm, but that within the last two weeks the spasm had increased. At no time had he lost control of the bladder. Examination showed paralysis and spasm the same as before. Sensation for touch and pain was not lost in the feet, legs, or trunk but was much diminished from below the level of the tenth thoracic segment area. Tenderness to pressure was at this time most marked at tenth thoracic spinous process. I noted that the ankle clonus on the right was less marked than formerly and that the Babinski sign was present on both sides.

On October 16th I operated again, removing the twelfth dorsal and first and second lumbar laminæ. There was no pulsation of the dura and no growth between the dura and the spine. On opening the dura a well marked, definite, bluish white membrane in the pia arachnoid bulged forth into the dural slit, there being no fluid between it and the dura.

This membrane formed a definite sac, apparently open below but at least partly closed at the upper end which lay under the lower portion of the upper scar. Clear serum escaped from the pial sac, exposing the clonus and the upper portion of the cauda. The pial

sac was cut away and the dura closed with catgut. Nothing abnormal was seen in the cord, and nothing abnormal was felt by a probe passed upwards and downwards. The wound was closed in layers with catgut allowing for a cigarette drain to the epidural fat on account of oozing from the diploe of a lamina.

On the following day the patient could straighten his legs somewhat and was free from the painful spasms. In ten days he was sitting up, the wound being firmly healed, and the legs did not flex spasmodically when he put his feet to the floor, as happened before operation. He had no pain in his legs and if the skin were rubbed or stroked no spasm was produced. He went home October 29th.

When seen in November, 1909, (three years after the second operation), he was well, able to do a hard day's work as inspector of buildings that required climbing stairs and ladders. As he walked the knees did not fully extend and the legs were slightly adducted, more than is seen in the average individual, but unless one were critically observing his gait it is doubtful if anything abnormal would be noticed. He had normal sensation and normal knee jerks. On full extension at the knee the ham strings were slightly tenser than normal. When overtired he would unconsciously, in his sleep, forcibly extend the legs. He had no pain.

He stated that by Christmas following operation he could stand up with assistance and in the following June he walked with a cane. By July he was able to take a long car ride and in the autumn of 1907 he was doing a full day's work..

After the patient's return home from the second operation Dr. Gray's treatment played so important a role in his recovery that I shall quote freely from her notes which she has kindly loaned me. She says: "As soon as the patient returned from the hospital I found the spastic condition still present to some extent, but the clonic spasm could not be excited. The thighs and legs were still held firmly by the contracted flexor and adductor tendons. At the end of two weeks I advised light massage and passive motions for the thighs and legs, leaving the back and abdomen entirely alone. Two weeks later the patient felt a return of the violent spasms of the abdominal muscles and was discouraged. I discontinued massage as soon as I felt that the patient had grounds for his suspicions and prescribed gr. 1-100 of corrosive sublimate with gr. vii of iodide potassium, three times a day.

"There was no more complaint of the spasm, and again, two weeks later, I returned to the medical gymnastic treatment, giving it myself in order to watch the result better. The internal treatment was continued.

"Slowly and tentatively I began with massage and passive motion, stretching the tendons very slightly beyond their voluntary limit. As the spastic condition grew less and only the mechanical contractions of the tendons remained to be overcome I increased the number and strength of the treatments, which by this time consisted of violent and continuous stretching of the contracted tendons. Manual force and resistive exercises, both manual and with apparatus, for the muscles antagonizing the contracted groups, were employed, and at the end of six months the patient was walking with the aid of a cane and crutch. Up to this time and several times later an acute swelling appeared occasionally in the left knee, apparently following a decrease in the drug treatment and always disappearing soon after the medicine was readministered. The medical gymnastic treatment was continued for a year with steady and, towards the end, rapid improvement, the adductor tendons being the last to yield. The medical treatment has not been given now for nearly two years."

The behavior of the joint swelling to mercury and the late progressive deafness, which, however, did not yield to drug treatment, suggest a specific cause for the spinal lesion. No treatment before operation had any influence on the paralytic phenomena, but this would be expected from what we know of the experience of others. As stated in the beginning, no history or evidence of a recent or an acquired syphilis could be obtained.

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THE CARE OF PREGNANCY AND LABOR COMPLICATED BY NERVOUS OVERDEVELOPMENT

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THERE is a widespread theory in the medical profession as a whole that the duty of the obstetrician is satisfactorily performed if the maternal life is saved. The life of the child is usually considered as a distinctly secondary matter, and the after health of the mother receives little or no consideration from the average practitioner. The untoward accidents which so commonly occur during pregnancy and labor are explained away in some more or less plausible manner, and the individual attendant is prone to shift the responsibility for the unsuccessful outcome of the case from his own shoulders where it really belongs, and give reasons for his failure which only accentuate his own shortcomings.

Unquestionably the preservation of the mother's life is the foremost duty of the obstetrician and cannot be subordinated to any other consideration. Somewhat less important, but none the less essential to the successful conduct of a case, is the life of the child, and no man should feel that he has conducted a case of pregnancy and labor properly in which a child which has reached a viable age is lost, when he has had personal charge of the patient throughout the pregnancy and labor. Some cases will of necessity arise in which the interests of the child must be endangered or sacrificed to preserve the life of the mother, and the prompt acceptance of the responsibility of saving the mother at the expense of the child is the mark of a man who appreciates the conditions which call for the sacrifice of the less important life in order to save the more important rather than to lose both.

If no untoward complications arise during pregnancy which demand the sacrifice of the child, we come to the conduct of labor, and here the duty of the obstetrician is to so conduct the labor that mother and child shall receive no serious injury, physical or nervous. A labor which results in invalidism to the mother through lack of appreciation of the conditions present, due either to physical injuries, which have not received proper attention, or to nervous injury through a blind adherence to a conservatism which demands non-interference with natural processes, must be counted as a failure, and the obstetrician who can number many such cases in his practice should consider most carefully whether the reason is not his own unfitness for the work, rather than the conditions which are present in the individual patients.

From the standpoint of the child, although death may not be caused by ill-advised methods of delivery, many serious injuries may be inflicted which may seriously affect its after health, such as cerebral hæmorrhage or obstetrical paralysis of lasting character. Each injury must be considered as at least a partial failure to conduct the case properly, unless before delivery the possibility of such injury is considered and the choice of treatment made freely with deliberate intent to run serious risks for the child for the sake of lessening the risk to the mother.

The after health of the mother is a consideration which should receive serious attention in each individual case, but which is seldom considered until too late. We may have no doubt as to the outcome as regards the life of either patient, but our responsibility cannot end there. Each patient must be carefully studied, particularly in relation to her power of standing pain and what effect the long continued pain of labor may have on her after life. The nervous history of the patient must be carefully studied to learn how she has endured such burdens as have been laid on her in the past. Is she nervously equipped to undergo what is usually a severe though not an overwhelming strain for a normal woman? If these questions can be satisfactorily answered so that we feel that a patient can properly be subjected to an ordinary labor, our course is

clear and we have nothing to do except to foresee, as far as possible, the occurrence of possible complications of labor.

In considering the conditions which exist to-day we must recognize that the modern civilized woman is a doubtful risk nervously, although she be physically well equipped. It is therefore an important part of our professional duty to lessen the strain during pregnancy and labor by every means which modern surgical science has given to us, in order that the great event of her life may leave no serious after effects, since there is no question but that many women have been more or less seriously invalided as the result of perhaps insufficient or improper care during pregnancy and labor. Of course the physical conditions resulting from labor, the repair of lacerations, and the prevention and cure of displacements, form a part of the duty of the obstetrician, and it should be his aim, difficult as it is of accomplishment in many cases, to bring every patient through the so-called physiological process, so that he can discharge her in as good condition as before the strain was undergone.

Obstetrics has long been taught independently of medicine and surgery, as if the three sciences were independent, but no thoughtful practitioner can fail to realize that scientific obstetrics means the application of the principles of medicine and surgery to the care of pregnancy and labor. The obstetric art is not a mysterious science and the application of common sense should be its dominant principle. Tradition has been a large factor in obstetrics for many years and still continues to be so. The reason for this is evident. Pregnancy and labor have so long been considered as natural physiological processes that it has been commonly said that the patient would do just as well if a doctor were not present at the time of labor, except for the prevention of hæmorrhage, and in the occasional case where the intervention of the obstetric art is necessary. There is no question but that pregnancy and labor should be natural processes, but the changes which have taken place in the nervous organization of our modern women, particularly the overeducated or overcivilized among our population, are so great that a large proportion have ceased to be natural women. The nervous organization has overshadowed and in many cases has dwarfed the physical development. The great frequency of nervous breakdowns in young women who should be in the prime of life shows that we are no longer dealing with natural women. The increasing frequency in which improper development of the pelvic organs, with the common accompaniment of lack of proper development of the pelvis, results in various degrees of pelvic contraction and is a sign of the times, and those whose practice lies among such patients are constantly impressed with the number of the unfit for whom they are asked to assume responsibility. In the profession as a whole there is a great lack of appreciation of these conditions. Every pregnant woman is considered normal until some untoward symptom calls attention to the fact that she is not so. In my opinion every patient brought up under the conditions of our city life should be considered as abnormal unless she can be proved to be normal by the most searching examination. The fact that the general practitioner receives an inadequate fee for the care of an obstetric case naturally tends to diminish his interest in obstetrics and leads him more and more to assume that all cases are normal. Another reason for lack of appreciation of the conditions is that obstetrics is disliked by the majority of practitioners and is done only as a routine to aid in building up the family practice in which they are more interested. It is natural under these circumstances that the average practitioner should not seek for the abnormal and should be satisfied as long as no evident complication arises.

It is the natural result of these conditions that the general practitioner should consider obstetric cases as disagreeable necessities, to be handled according to certain fixed rules, and should assume the great majority as being absolutely without abnormal possibilities and treat them as such, although no means have been taken to ascertain whether they conform to the normal or present some feature at variance with it. It is a prime necessity to the proper conduct of obstetric cases that each case should primarily be considered as offering every possible variation from the normal, and

that it should only be placed in the class of normal cases when an exhaustive study has failed to demonstrate the existence of some abnormality.

The study of the pelvis and its demonstration to be normal by a careful mensuration is admitted at the present time to be a part of the duty of every obstetrician, but the majority of practitioners lose sight of the fact that it is not the absolute size of the pelvis, except in the rare case, which is important, so much as the relative size as compared to the individual child.

A second consideration of importance is the estimate of the muscular power in the individual patient, whether a given patient is likely to be able to deliver herself without undue exhaustion, or whether the muscular power will probably fail before the delivery is accomplished, and operation become necessary on an exhausted patient. In women of poor muscular development, and in those who through lack of exercise are flabby muscularly, it is probable that the expulsive power of the uterus will be inadequate for the work to be performed, and although in many cases the reverse will be found to be true, in the majority of women who are poorly equipped, labor will be abnormal and recourse to the obstetric art necessary to effect delivery, and if operation is deferred until the patient is nervously and physically exhausted, an unsatisfactory recovery is almost inevitable. The question at once arises as to what is the best method of treating these cases in order to insure a satisfactory result, not only at the time of delivery but as regards the after health of both patients.

A third factor to be considered is the probable nervous resistance of the patient, whether in the first place she is liable to have a nervous explosion at the time of, or shortly after labor, even although not exhausted physically, and in the second, whether the after effect of pain and the exhaustion of labor may not have a lasting serious influence on her after life. In the uncivilized woman these conditions need not be considered, but in the modern society woman they are of considerable importance.

It is necessary in each case to learn what the patient's early life has been, aside from actual disease, in order to appreciate what the probabilities are. In many instances it will be found that in order to turn out the girl as a finished social product at the proper age, she has been subjected to such educational and social strain at the time of puberty and later, that instead of developing normally a forced mental and nervous development has taken place, which has overshadowed the physical, and she is merely a bundle of nerves, reacting out of all proportion to every slight impulse even though physically she may be well developed. In addition to the improper conditions under which she has lived, the strain of entering society often has a serious effect. Such exercise as is taken has been at the expense of proper rest and recuperation, and is simply in many cases an added burden rather than a relaxation. It is estimated in Boston that the majority of the girls who enter society have at least one or more nervous breakdowns, demanding at least a modified rest cure, before reaching the age of twenty-five, the time when the woman should be at the height of her powers. This condition naturally leads to the conclusion that at least half of the society women are nervously unfit to undergo unnecessary burdens in their after life, and every safeguard must be employed to prevent the strain of pregnancy and labor from producing serious, and perhaps lasting effect. The same may be said to be true of a large proportion of college women who have simply overtaxed themselves in other ways and have produced a similar result.

A third group which must receive careful consideration, is the class of women who have always been sickly and delicate, though perhaps have never had any serious illness; patients who unquestionably would not have reached maturity, except for the unusual care which has been bestowed upon them and who are obviously both physically and nervously unfit for the strain of maternity. This preservation of the unfit and the constant overstrain of those originally fit produce a similar result, and have developed a class of women in the community who are bad subjects for pregnancy and labor, and who have all that they can do to maintain their equilibrium under the ordinary conditions of life, and who necessarily fail when an added burden is incurred.

Another class which must receive careful attention, both during pregnancy or at the time of labor, are the patients who perhaps have shown no definite weakness before pregnancy and in whom during pregnancy no definitely pathological conditions can be discovered, but who develop a lack of accommodation, if so it may be called, to pregnancy. The patients who suffer from minor toxemic conditions, increased and unduly prolonged vomiting, but who never reach a point definitely pathological; who do not improve physically, as every woman should, during pregnancy, but who are distinctly in worse condition at the end of pregnancy than at the beginning; who have been unable or unwilling to take proper exercise in order to improve their physical condition on account of the discomfort involved, or because they are oversensitive about appearances, and who come to labor flabby and in no condition to go through a severe physical strain. In these cases it must not be forgotten that the cardiac muscles suffer in proportion to the general muscular condition, and acute cardiac dilatation with its concomitant symptoms is a frequent result of the strain of labor, as is so often seen when an untrained athlete in the spirit of competition subjects himself to a contest for which he is poorly prepared. When all possible physical and nervous factors have been taken into consideration, there remains one other point which must always be doubtful in many cases, and that is: it is impossible to estimate accurately the effect of the pain of labor as such on the given patient. The fact is evident that one patient will stand what seems to be severe pain with little or no reaction, whereas the next may react intensely to an amount of pain which seems almost negligible. In these cases the effect of pain, *per se*, if endured for any length of time, on the after health of the patient deserves serious consideration and the question of either ending labor at the moment when pain seems to be increased beyond the normal, even though operative interference is demanded practically at the beginning, or at least very early in labor, is one which must be seriously considered in order to prevent a nervous breakdown on the part of the patient.

The general indications to be met in the treatment of unfit parturient women at the present time may be divided into prophylaxis and palliation. In prophylaxis it seems to me that a great deal is possible, perhaps not so much in the individual case as seen to-day, as in the future. There can be no question but that the pernicious influence of early education is one of the most serious factors with which we have to deal. The social standard is at the present time so definitely set that a girl's education is crowded into a few years, so that she can be turned out as a finished society product at a definite age with all the modern accomplishments, and this necessitates a system of hothouse education during the years from twelve to eighteen, at the time when she is undergoing her greatest physical development. Naturally the average girl must suffer in the attempt to keep with her better equipped sisters, and to reduce the damage done to the minimum it is necessary to point out to the parents what the logical outcome of this system of development must be. It is of course, impossible to change at once a system which has been the outgrowth of years of social competition, but I believe that few parents would be so socially ambitious as deliberately to sacrifice their daughter's welfare if the risks incurred are carefully pointed out and the means for minimizing the damage furnished. It is the rule rather than the exception at the present time that the day and evening of the city bred girl is entirely taken up with fixed engagements, and no time is left for rest and relaxation.

I believe that a great deal can be accomplished in the future, but at present the question that we have to meet is how to deal with the patients who come to us for care at the present time, with reference to reducing the strain, which they must undergo, to a minimum. In the first place, each patient must be very carefully studied in order to determine the class in which she belongs, whether she is to be classified as definitely unfit for the strain of labor and to be treated as an abnormal patient by abnormal methods, or whether she is to be considered as a relatively normal patient, and only to be treated by unusual methods when she shows signs of physical or nervous failure. If a patient is considered as being absolutely

or relatively unfit, extreme care must be used throughout the pregnancy to guard against possible complications. The hygiene of her life must be absolutely regulated and she must be treated from the start as if pregnancy and labor were pathological conditions, which, unless held in check, are sure to result seriously. Many of these cases when the time for delivery approaches can be recognized as unfit to go through the strain of an ordinary labor, even though early operation may be practiced to diminish the risk, the question of pain and exhaustion being serious matters for the individual.

It has long been recognized that many of these patients will stand operation well, though a long continued strain will predispose to either physical or nervous collapse, and there only remains in the proper care of these cases the choice of operation, whether the patient shall be delivered by Cæsarean section with no indications except her general condition, or by dilatation of the cervix and extraction, by forceps or version.

In the cases on the border line and in those in whom it is calculated that no definite harm will result from labor much may be done toward lessening the pain and exhaustion consequent on labor, by the early use of anæsthetics, ether or chloroform being used early; or at such time in the first stage as the patient seems in need of relief, morphine and scopolamine being employed in carefully graded doses. In all cases, especially in those who seem relatively unfit to undergo the strain, I believe that the advantages of surgery should be employed and the patient delivered instrumentally at the earliest moment possible without the risk of undue damage. This time will necessarily come earlier in the practice of an expert than in the practice of an average practitioner, and can only be determined by the estimate of the individual case, as to when the risk in operation is less than the danger of permanent damage by prolongation of labor.

Another important part of the care of the obstetric case is a careful supervision of the convalescence and the repair of the damage caused by labor. The most important part of this is prolonged rest in bed, with the patient under conditions of mental quiet and absence of strain. The custom of allowing patients to get up at the end of ten or twelve days is to my mind a pernicious one, and I believe that three weeks' rest in bed after confinement is none too long to insure a good result. During the convalescence, after the tenth day much may be done, as pointed out by Gellhorn, to keep up the strength and to aid and improve the general condition by properly regulated exercises. Before the patient is allowed to get up, the pelvic condition should be carefully ascertained; any malposition of the uterus should be corrected, and if there is any tendency to subinvolution, the patient should be kept quiet until satisfactory involution has taken place. If lacerations require operation, either because they were not sutured at the time of delivery or because of failure to heal properly, the condition should be remedied before the patient is discharged from care, although it is wiser in the case of moderate cervical lacerations, to delay until it can be learned whether they are giving symptoms or not, rather than to subject the patient to an immediate secondary operation which may not only prove unnecessary but which may seriously complicate future deliveries. Perineal lacerations are more important and require immediate operation as soon as the local conditions will warrant it, before a condition of prolapse of the vaginal walls can occur.

The proper treatment of an obstetric case depends on a careful study of the conditions in the individual case. In certain cases the treatment can be predetermined by the previous history of the patient, while in other cases progress of events must be watched and the conduct of the case determined according to the conditions which arise. If the patient belongs to the definitely overcivilized class, the treatment must be so chosen as to be adapted to the special conditions present.

In certain cases it will be found that delivery before labor begins is advisable, and whether delivery shall be effected by the abdominal route in the absence of other indications or by accouchement forcé, must be determined by the other factors in the individual case.

In a second group of patients it will be unquestionably wiser to allow the patient to go into labor and see what she can accomplish

without undue exhaustion or suffering and to deliver her immediately, either when progress ceases to be perfectly satisfactory or when the effect of labor becomes evident. If the patient is a multiparous one, the history of previous labors must be taken into account, and if any abnormal condition complicated previous labors, it is to be expected that similar conditions will arise in the progress of the individual case, since it is the general though not invariable rule, that if the uterus has acted unsatisfactorily in one labor it will do so in subsequent labors, and the condition must be met promptly and actively. If the previous history contains no clue to the treatment of the individual case and if the general nervous and physical conditions are fairly satisfactory, the patient should be allowed to go into labor, an attitude of careful watchfulness maintained, and labor terminated by operative means at the first indication of failure. This means, of course, that the obstetrician must have personal charge of the patient from the beginning of labor and not entrust the care of the early part of labor to the hands of a nurse, which is apparently a very common practice. It is only when he has watched the patient from the beginning that he is in a position to recognize slight departures from the normal, and it is well recognized that slight abnormalities can often be easily corrected, when if they have persisted for some time, delivery may be either extremely difficult or dangerous to both patients.

If operation is advised either before labor begins or during the progress of labor, the main indications of operation should be kept clearly in mind. The chief considerations are: in the first place the least risk to life of either mother and child; in the second, the minimum shock and possible physical injury to both patients; and third, the reduction of nervous strain of the mother so that labor shall have as little effect on her after life as is possible. When operation is undertaken either before labor begins or during labor, the choice of operation must depend to a considerable extent on the ordinary obstetric rules. The size, shape, and inclination of the pelvis must be taken into careful account and the relation of the individual child to the individual pelvis must be carefully studied. The number of previous pregnancies, with the intervals between them, and the behavior of the uterus on the one hand and the patient on the other, must receive careful consideration.

In primiparæ the age of the patient may be an important factor in determining the choice of treatment. In addition to age the length of time since marriage, with the previous history of miscarriages, must be taken into account, for if the patient who has been married for several years but has never been pregnant, or gives a history of several miscarriages, and this is the first opportunity for a living child, the life of the child must receive more consideration than in the ordinary case, and the treatment must be so directed as to insure the life of the child by any means which do not involve the sacrifice of the mother. The mental attitude of the patient and her nervous condition must be taken into serious consideration in all cases. If the child seems of paramount importance to the mother, as is usually the case in elderly primiparæ, it is legitimate to advise such operation as will insure the life of the child, even though there may be no definite indication present for the operation. If the patient has reacted badly to pain in the past, all means to make labor as painless as possible should be adopted. The patient's attitude toward future pregnancies must always be taken into consideration, and if the patient is unwilling to go through future pregnancies the case should be classed among those in which no unnecessary risk is taken for the child. The rigidity of the soft parts, the history of past nervous breakdowns, and the reaction of the patient to discomfort and pain in the past, must be taken into consideration. These conditions will often call for what seems an unusual, and according to many writers, an unjustifiable procedure. There can be no question but that abdominal Cæsarean section is the safest operation for the child, and if the child is of paramount importance, even though no other indication for operation exists, Cæsarean section should be the operation of choice.

We recognize to-day that the elective Cæsarean section, performed before labor begins, carries with it nothing more than the mortality and morbidity of accident, when performed by a competent surgeon, and, there-

fore, it may be unhesitatingly recommended to the patients who are in the class where the life of the child is of extreme importance. Aside from guaranteeing the life of the child it is attended with so little shock and risk to the mother, that I believe the indication should be widely extended, and that it is distinctly an operation to be performed on those who are considered unfit for the strain of labor and in whom it is feared that pelvic injury at the time of delivery may produce invalidism.

It is important to apply the ordinary surgical principles in the care of an obstetric case and we must recognize that many patients will undergo a serious surgical operation without marked reaction, who will react badly to pain and exhaustion. There is no reason why we should any longer allow the traditions of obstetrics, which originated when surgery was, to say the least, in a questionable position, to continue to govern our choice of treatment at a time when abdominal surgery on uninfected cases can be considered almost without risk.

Under modern conditions, it is almost criminal that obstetrics should be so largely in the hands of those who are either unfit or unwilling to take the time to do it properly, and who of necessity, because their experience is not such as to warrant them in departing from obsolete practice, follow blindly the traditions of a science which is recognized as a definite specialty. From painful experience I believe that the average general practitioner is perfectly satisfied if his patient lives, irrespective of the life of the child or the physical and nervous damage inflicted on the mother. Even in the most serious complications of pregnancy and labor, hæmorrhage and toxemia, palliative treatment is still the mainstay of the general profession, and serious conditions are allowed to go indefinitely without adequate treatment. Necessarily, the minor conditions which do not endanger the life of the mother, receive very little attention and in fact are largely disregarded and no departure from the routine in the care of an obstetric case is considered wise, if indeed any thought is given to it at all.

The interesting paper by Gellhorn of St. Louis on "The Physical Culture of the Puerperium," in which he states that out of 291 patients in 156 the causal relationship between confinement and gynecological disease was evident, shows more clearly than anything else what the present practice of obstetrics is and how great is the need for improvement of the methods in vogue.

In our larger cities among the American born population, the effects of overcivilization is an increasingly important factor and calls for serious consideration. That a class of women nervously unfit for the burden of pregnancy and labor exists, is often denied by those whose practice lies largely among the foreign born or in the newer civilization of the West. With us, however, where the struggle for social supremacy is active, and has been for generations, or where the desire for higher education, which is often improperly regulated, is predominant, the number of young women who suffer from nervous breakdown before marriage, with the liability of a more serious one later, should be a powerful influence in calling for a new obstetrics, based not on the average, but on the unfit.

THE FREQUENCY OF CONGENITAL SACS IN OBLIQUE INGUINAL HERNIA[1]

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ALTHOUGH Camper, in 1762, and Wrisberg, in 1779, made dissections and called attention to the fact that inguinal hernias were due to a persistence of a patent processus vaginalis, the impression continued to prevail, even up to modern times, that a hernia was of necessity the result of some sort of violence with tearing or rupture of tissues.

A close study of this region at operation, and the examination of the sacs in situ and after removal, forces upon one the conviction that many of these cases were of congenital origin. This is not infrequently borne out by the clinical history. How else can we explain the case of a previously sound man, who after lifting a heavy load, suddenly acquires a bulging in the groin? How do we account for the different types of sac formation to be detailed later?

An understanding of the development and closure of the tunica vaginalis is essential, and explains the different varieties of sac formation.

MIGRATION OF THE TESTICLE

During early fœtal life the testicle is an abdominal organ and lies in the region of the kidney. It is surrounded by peritoneum, which forms posteriorly a sort of mesentery or mesorchium through which the vessels and nerves reach the organ. To its lower extremity there is attached a musculofibrous band, called the gubernaculum testis hunteri. This passes through the inguinal canal and is attached to the bottom of the scrotum. The testis in its descent reaches the internal ring about the seventh month. At this time a small indentation of peritoneum has formed at the spot where the gubernaculum leaves the abdomen. This is the beginning of the tunica vaginalis, and the same factor which causes the descent of the testicle operates in elongating the peritoneal process. The latter pushes through the inguinal canal into the scrotum, carrying in front of it the subperitoneal tissue, the infundibuliform process of the fascia transversalis, some fibres of the internal oblique muscle, which form the cremaster and the intercolumnar fascia. At the same time the testicle passes into the scrotum, which it reaches shortly before birth. *The peritoneal diverticulum or incipient tunica vaginalis is present before the testis begins to traverse the abdominal wall.* Hence the vaginal process cannot be considered the result of a bulging of the peritoneum caused by the testicle. On the contrary, the testicle and vaginal process are united, and descend together and if the agent ceases to exert traction the descent is arrested. The gubernaculum may even cause a diverticulum of the peritoneum, and leave the testicle within the abdomen. The right testicle is later in its descent than the left.

The peritoneal sac which preceded the testicle is at first continuous with the general peritoneal cavity, but soon after birth it becomes obliterated. According to Sachs the obliteration is accomplished ten to twenty days after birth. There are three points with reference to the vaginal process at which there is the greatest tendency to constriction and obliteration, namely, first, at the internal ring; second, at the external ring, and third, a point just above the testicle. The vaginal process first begins to close at or below the external ring, and more rapidly in a downward direction than upward. Normally, therefore, by the end of the first month of life the vaginal process has obliterated from the internal ring to the testicle, leaving only the tunica vaginalis testis. Evidences of the obliterated tunica in the shape of fibrous cords have been found in dissections, extending from the internal ring to the testicle.

Various theories have been offered to explain the closure of the vaginal process. Camper suggests it is the growth and development of

[1] Read January 7, 1910, before the Chicago Surgical Society.

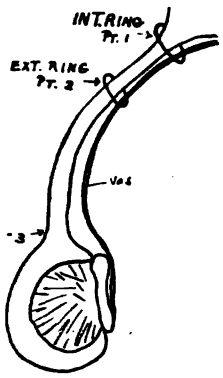

Fig. 1.

Fig. 1. The vaginal process is represented as being completely open and continuous with the peritoneal cavity. The internal and external rings are represented by ovals. The three points where obliteration of the vaginal process is said to begin most actively are indicated at point 1, 2, and 3, respectively. This case is one of "congenital hernia," employing the old nomenclature. The vaginal process has made no effort at all at closure.

Fig. 2.

Fig. 2. The vaginal process has almost completely closed, only a small infundibuliform process remaining, from the apex of which a fibrous cord (the obliterated tunica vaginalis) could be traced down to the testicle. Clinically there was a widened inguinal canal with some impulse on coughing. (Weiche Leiste, of the Germans.)

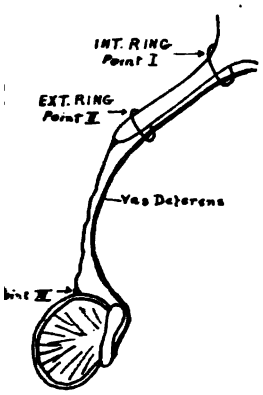

Fig. 3.

Fig. 3. This patient had a large direct hernia, and on the same side there was a potential oblique sac. The latter was very thin and glove-finger-like, and about the diameter of an ordinary pencil. It extended slightly beyond the external ring, was empty, and had evidently never been occupied by either bowel or omentum. From the fundus a band was traced down to the testicle. Obliteration of the vaginal process had been completed from point 2 downward, but remained open above.

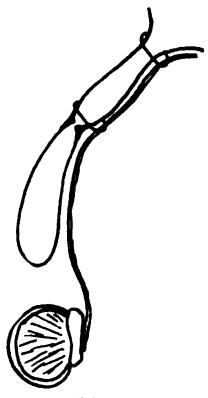

Fig. 4.

Fig. 4. A case in which the sac presented a thick annular constriction, corresponding with the external ring. At this point strangulation of the contained omentum had occurred. In this case closure of the process had been completed above the testicle, and the constriction at the external ring shows the effort at closure at that typical point. In large hernias this constriction has usually been carried down into the scrotum.

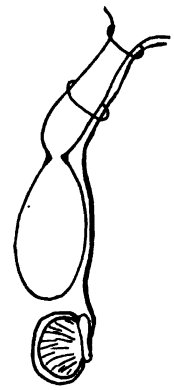

Fig. 5.

Fig. 5. A case similar to case 4, with the point of constriction displaced into the scrotum, forming an hour glass sac.

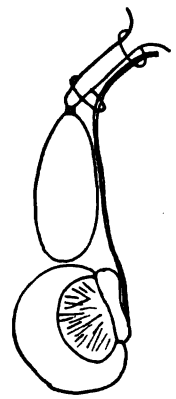

Fig. 6.

Fig. 6. A case with a small glove-finger-like sac containing omentum. To the fundus, which corresponded in location to the external ring, there was attached by a fibrous band a sausage-shaped sac filled with serous fluid. This hydrocele was intimately connected with the vas and vessels. There was also a small hydrocele of the tunica vaginalis testis, but no organic connection existed between the two hydrocele sacs. The explanation of these findings is that obliteration occurred at points two and three, but the intervening portion of the tunica did not close, forming the two distinct sacs, and the hernial sac above.

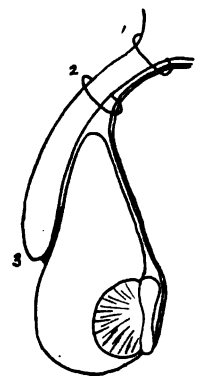

Fig. 7.

Fig. 7. A case in which there was found a moderately large hydrocele of the tunica vaginalis testis, in addition to a hernial sac, which was narrow and thin, overlapping the hydrocele, and adherent to same. In this instance the constriction took place at point three, and the sac remained entirely open above. Subsequently the hydrocele developed, growing in an upward direction, and overlapping the sac.

Fig. 8.

Fig. 8. A case somewhat similar to figure 8, except that the sac shows a constriction slightly above the external ring. The fundus of the hernial sac and the small hydrocele of the tunica vaginalis testis were adherent and overlapping.

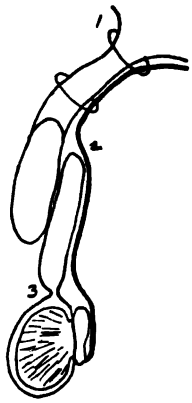

Fig. 9.

Fig. 9. A case in which there was a hernial sac, the distal portion of which was partitioned off and contained serous fluid. Extending upwards from the tunica vaginalis testis, and communicating with same by a small opening, was a sac closely adherent to and extending almost to the external inguinal rung. This latter funicular sac and the lower part of the hernial sac were overlapping and adherent. In explanation it is suggested that originally, before the hernia developed downward, these sacs were in contact, but not overlapping. At point two the vaginal process might easily have become constricted at two places, leaving a separate chamber in the fundus of what later became a hernial sac. The funicular portion of the vaginal process remained open from point two downward, making some attempt at closure at point three above the testicle.

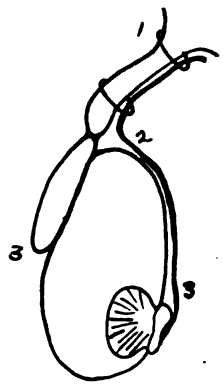

Fig. 10.

Fig. 10. A case very similar in its origin to case 9. There was a hernial sac extending slightly beyond the external ring. To the fundus was attached a thin elongated serous sac containing fluid. There was a large hydrocele of the testicle extending upward and closely related to the vas and vessels. The two serous sacs were overlapping and adherent. This case might be explained in two ways. First, that conditions were as in case 10, which it resembles very closely, save that there was no constriction at point three. Second, that the case early was like case 7, only that the hydrocele of the tunica vaginalis testis became relatively much larger, and as it grew upward, overlapped the other serous sac.

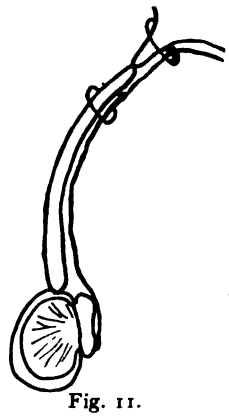

Fig. 11.

Fig. 11. In this case there was a closure of the tunica vaginalis at the internal ring, and at a point above the testicle. The intervening portion remained open and contained a small amount of fluid. The malformation was noticed since birth, and the patient, a boy of twelve years, was supposed to have a hernia. The case was one of funicular hydrocele, although there was a small hernial sac present. The lower end of the hydrocele was blended with the tunica vaginalis testis. The former was intimately adherent to the vas and vessels.

Fig. 12. A case of large bilocular or hour glass hydrocele, which simulated a hernia in that it was reducible into the abdomen, and gave an impulse on coughing. The scrotal portion of the hydrocele communicated with the abdominal (subperitoneal) portion by means of a constricting neck in the inguinal canal. This communication was the size of the index finger. In a case such as this it can be assumed that the vaginal process closed at point one, the internal ring. The entire lower portion remained patent, and in time fluid collected in the sac. As the fluid increased in amount, the inguinal canal was gradually distended, as with a colpeurynter, and afterward the sac bulged into the peritoneal cavity, but under the peritoneum. Eventually the hour glass formation was complete. How else could a hydrocele force its way into the inguinal canal, unless there was already a membrane extending into the canal?

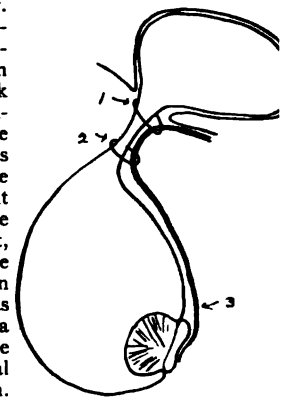

Fig. 12.

Fig. 13. This case was one of hydrocele of the cord, or funicular portion of the tunica vaginalis. The explanation is simple. Complete obliteration of the vaginal process took place between points 1 and 2, namely, the portion within the inguinal canal. Constriction also occurred at point 3, the point above the testicle. The remaining portion remained patent, and filled with fluid.

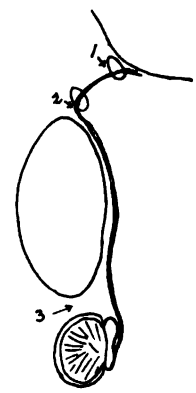

Fig. 13.

Fig. 14. A case in which there was a thin, narrow, glove-finger-like sac extending slightly beyond the external ring. To the fundus of the sac there was attached a small thin walled cystic body, which contained a small amount of clear fluid. Sac and cyst were closely adherent to the vas. This condition can be explained on the theory that the vaginal process remained open from above to slightly beyond the external ring. The funicular portion obliterated almost completely, leaving only a small portion at its upper end open, and this later filled with fluid.

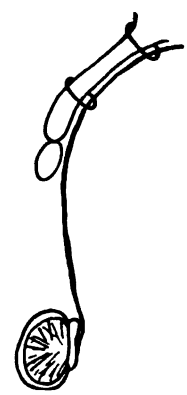

Fig. 14.

the pelvis. Bell says it is a local irritation and contraction due to the passage of the testicle. Heoin believes the cause to be a local muscular contraction. Broca draws an analogy with monkeys, from the fact that in the case of monkeys that walk upright, the vaginal process closes similar to that of man, while in those that walk mostly on all fours, the process remains open.

The normal migration of the testicle and closure of the vaginal process having been considered, we now turn to the cases of faulty and incomplete closure for an explanation of the different kinds of sacs which we find at operation.

That incomplete closure of the vaginal process is by no means uncommon is shown by the following statistics.

Zuckerkandl — 100 infants.
- Vaginal process open on both sides..... 20 times.
- Vaginal process open on right side..... 12 times.
- Vaginal process open on left side ..... 5 times.

Camper — 70 infants.
- Vaginal process open on both sides..... 34 times.
- Vaginal process open on right side..... 14 times.
- Vaginal process open on left side ..... 8 times.

Fere — 146 dissections of infants up to eighteen months.
- Complete closure both sides..... 84 times.
- Incomplete closure both sides..... 33 times.
- Both sides entirely open..... 8 times.
- Open on one side only ..... 10 times.

Sachs — 155 infants.
- Complete closure both sides..... 47 times.
- Open on left side..... 8 times.
- Open on right side..... 32 times.
- Open on both sides..... 26 times.

Crickx — 32 infants up to two years of age.
- Open on both sides..... 13 times.
- Obliterated on both sides..... 16 times.
- Open on right side..... 4 times.

From these anatomical studies it would appear that the vaginal process on the right side remains open or unobliterated in some degree, twice as often as on the left side. This bears a significant resemblance to the preponderance of right oblique hernias. Finally in over one-third of all these infants dissected, come defect of closure of the vaginal process was found.

We will now seek to show how the various deviations from the normal closure of the vaginal process tend to explain some of the different types of oblique hernial sacs, which we find clinically at operation. The schematic figures here reproduced are made from actual cases in the author's practice.

How can a hernial sac at operation be recognized as of congenital origin? Has a congenital sac any characteristic features? While it is not possible in many cases to make a positive diagnosis, yet the following points are of value in making a decision:

1. Glove-finger-like and narrow sac, generally empty.
2. Thin wall.
3. Absence of subserous fat.
4. Trabeculated structure.
5. Annular constrictions, which oftentimes still correspond with the internal or external ring. Frequently the constriction has been displaced beyond the ring.
6. Thickening of fundus.
7. Fibrous process extending downward from fundus for a variable distance, sometimes attaching to the tunica vaginalis testis.
8. Close relationship of sac to vas deferens and spermatic vessels. The latter may be spread over the sac.
9. Sac still enveloped by fibres of the cremaster muscle.

CONCLUSIONS

1. The chief etiological factor underlying the development of oblique inguinal hernia in fully three-fourths of the cases can be traced to the pre-existence of a congenital sac, the result of faulty closure of a part or the whole of the vaginal process. This proposition has been sustained in the last one hundred operations in the author's practice.

2. Congenital malformation takes a minor part in the causation of oblique hernia, while it plays a most important role in the etiology of direct hernias. The malformation is manifested by an underdevelopment of the arching fibres of the internal oblique and transversalis muscles. These muscles do not in these cases join to form a conjoined tendon with insertion into the pubes, but pass directly inward to be inserted into the sheath of the rectus muscle. This leaves a triangular area, bounded above by the above mentioned muscle fibres, internally, by the edge of the rectus, and below by Poupart's ligament. This area is unsupported except by the transversalis fascia and the fascia of the external oblique muscle. This local

weakness is the underlying factor in direct hernias, although it has considerable influence in those cases where there is present a preformed sac.

3. The fundamental reason for the existence of so many oblique inguinal hernias being the preformed sac, it follows that at operation one of the most important steps consists in the proper ablation of the sac. By this is meant a high ligation, seeking to avoid the leaving of an infundibuliform process, which will tend towards a recurrence, no matter what the type of suturing has been. This will insure more permanency than many of the refinements in technique that are being suggested and claimed as essential. Our experience with femoral hernias sustains this view, as shown by the abandonment of the many very complicated operations in favor of a simple one with complete removal of the sac.

A FURTHER REPORT OF A NEW OPERATION FOR ARTHRITIS DEFORMANS AND CERTAIN OTHER DEFORMING AFFECTIONS OF THE HIP[1]

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THE following paper is a later report and a supplement to the one published in The Journal of the American Medical Association, June, 1908, in which the first case herein cited was reported, and four others were mentioned. Since that time, the writer has added to his list of operations nine cases of advanced arthritis deformans, and two cases of tuberculosis in adults, thus making a total of sixteen. Of these cases, one, a woman forty-five years of age, died ten weeks after the operation. The wound healed by first intention and remained healed. However, an autopsy revealed a collection of pus near the hip (which had not been detected before death) and advanced chronic diffuse nephritis. The urinary report was negative before the operation, but casts, albumin, and all the elements of diffuse nephritis appeared directly after. The remaining thirteen cases have had uneventful convalescences, and the results have been extremely satisfactory.

The osteo-arthritic cases have varied in age from twenty-two to sixty-seven years of age; in weight, up to two hundred and twenty pounds. Two have been operated two years or over; two over one and one-half years, and three over one year. This operation has also been done, to the writer's knowledge, twelve times by ten different surgeons, all of whom have personally reported very satisfactory results.

It has long been a well known fact that a large number of progressive and advanced cases of arthritis deformans of the hip, with the accompanying deformity and disability, fail to be relieved by the conventional methods of hygiene, rest, and brace treatment, and

Fig. 1.

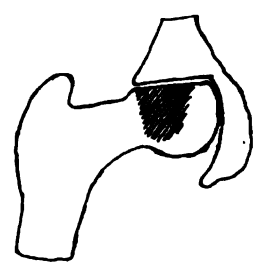


Fig. 2.

Fig. 1. The broken lines indicate the amount of bone to be removed. It is removed from the head and the acetabulum in different planes in order to secure the desired abduction of the thigh, when the freshened bone surfaces are brought together.

Fig. 2. Apposition of the freshened bone surfaces after the removal of the bone from the head and the acetabulum and the femur placed in slight abduction. The blackened area indicates where the cartilage is removed when the femur is strongly rotated outward for that purpose.

[1] Read at the Sixteenth International Medical Congress at Budapest, 1909, and before the Hoffa Orthopedic Club of Berlin, September 6, 1909.

Case 1. Note the flattening of the femoral head and the osteophytes at the upper and the lower rim of the acetabulum.

progress toward or to complete invalidism. There is also a second larger class, composed of working men, with dependent families, who cannot submit to the long brace treatment, even if there are good chances of their final recovery.

When the following marked anatomical and pathological changes are present, such as wearing away of the femoral head and acetabulum, eburnation, osteophytes, and the associated flexion and adduction deformity, how can satisfactory results be hoped for from the above mentioned expectant treatment?

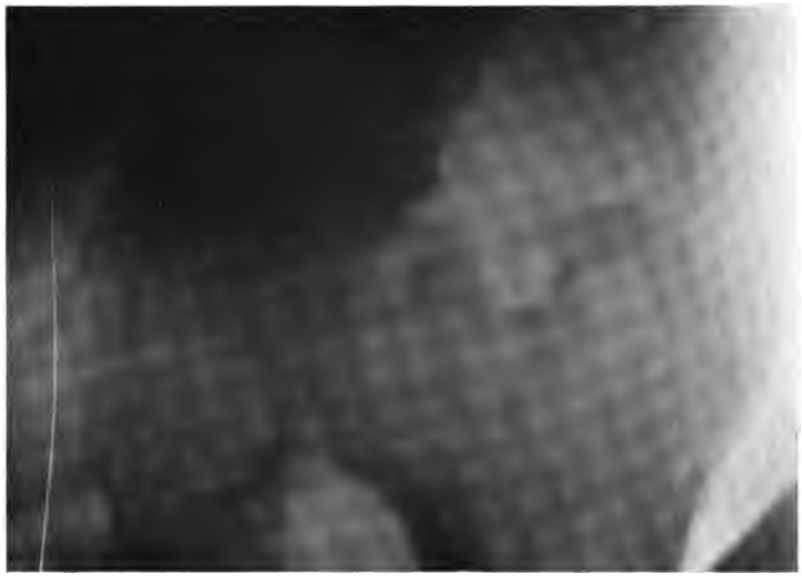
A resection of the upper extremity of the femur has been practiced by Hoffa and others with very unsatisfactory results. Hoffa was one of the last to discard complete excision.

CASE 1. (Reported in part as stated above.) In October, 1906, M. N., a policeman 59 years of age, was referred to the writer by Dr. J. L. Moriarty, of Waterbury, Conn. An examination revealed arthritis deformans of the right hip. Hygienic and brace treatment were recommended and explained. It was declined on the ground that it was so long, and possible results were too uncertain, for a working man with a dependent family. The following May (1907), this patient returned to the writer and begged that something be done for him. He was admitted to the Post-Graduate Hospital, May 14, 1907, and gave the following history: Age 59, policeman for the past twenty-five years. Three years before he first began to notice pain and stiffness in the right thigh and hip. Soon after this, he went to Mt. Clemens, where he took a considerable number of baths. His general health was improved, but the pain and disability continued as before. Two years ago he was examined by a physician, and told that his right hip was dislocated, and that the right leg was two inches shorter than the left. The symptoms became so severe that, three months after, consulting writer in December, 1908, patient went to New Haven and submitted to an operation, the nature of which could not be ascertained. Lameness, stiffness, and pain continued unabated. The physical examination revealed a muscular man with a pale and careworn expression; a marked right limb. His right shoe was built up with a cork extension two and one-half inches thick. The leg was much atrophied and markedly adducted and flexed. A long linear scar was noted over the right trochanter. The actual bony shortening of the right was one-fourth of an inch. The practical shortening was two and three-fourths inches. The motions were very slight except for the presence of about one-half of the normal amount of flexion. Attempts at passive motion were painful. There was some muscular spasm. A skiagraph showed the head of the femur much worn away and flattened, with many bony outgrowths about the rim of the acetabulum.

In view of the disorganization of the joint, the marked adduction and flexion, with firm muscular contractures, and the progression toward bony obstructive ankylosis with the leg in the above mentioned faulty position, in a person so large and muscular, it seemed best to aim for an immediate firm ankylosis, by means of an operation, if possible, and in order to compensate for the existing practical shortening, to place the limb in a position of slight overcorrection of the deformity. Therefore, the operative indications were to devise a procedure which would, if possible, fulfil the above requirements, and at the same time produce of itself as little bony shortening as possible.

With the foregoing desiderata in mind, the following operation was executed:

The hip joint was reached by an anterior incision, five inches long, through skin and subcutaneous tissues, starting from just below



Case 2. Note the marked flattening of the head and the osteophytes above the digital fossa.

and inside of the anterior superior spine of the ilium and extended downward. The sartorius muscle was retracted outward. The deeper muscles and structures were separated by blunt dissection and the iliacus and the rectus femoris muscles were retracted inward. A part of an extensive ring of osteophytes about the acetabulum was turned upward with the soft tissues adherent to them, because it was thought wise to preserve as many as feasible, on account of their bone producing possibilities. In so thick a thigh, with the presence of so much bony outgrowth, it required some care to locate the joint definitely. With the head of the femur in situ, approximately one-half of its upper hemisphere was removed with a large chisel, through a plane nearly parallel with the long axis of the neck of the femur. Then with the same instrument, and a strong curette with a cross handle, the acetabulum was transformed into a flat-surfaced roof, against which the flat surface of the head was finally brought into firm contact by abduction of the thigh. Upon attempting further abduction, it was found impossible on account of the shortened adductor muscles. An open tenotomy of these muscles and tendons was found necessary before the leg could be brought into proper position. The acetabular and head surfaces were then brought into contact by simply abducting the thigh. The capsule and soft tissues were sutured.

Access to the joint was much facilitated by a position of extreme abduction of the limb. For purposes of orientation, an assistant was kept in constant readiness to rotate the femur, while the operation was going on. The bone was removed in such a way that the flat pelvic surface was tilted up mesially somewhat, in order to produce, in a way, a locking of the parts, and to prevent any possibility of dislocation from weight bearing. The leg was finally put up in a spica, from the axilla to the toes, in strong abduction and ten degrees of flexion. The convalescence was uneventful, and the patient was walking at the end of four weeks with the aid of crutches. A short spica was substituted for the long one at the end of five weeks. The patient walked at the end of nine weeks without the aid of crutches or cane. He went back to work as a patrolman in four months. The patient now states, two years and three months after the operation, that he has not suffered any pain whatever since he left the hospital, although he is at work continuously. The leg has remained extremely well in the corrected position, and only a fourth of an inch of extra leather has been

Case 3.

worn on the heel. His occupation since the operation vouches for his locomotive abilities. He has continued as a patrolman, working nine hours a day, and has not lost any time on account of his hip since he went back to work in September, 1907.

The following improvements in the technique have been carried out in the last ten cases, in addition to the operative steps already described:

The portion of the acetabulum, overhanging the femoral head, is thoroughly removed. This exposes the head and facilitates the removal of its upper part. With the head in situ, the upper half hemisphere is removed en masse, as described above. This fragment is then split at right angles to its cut surface with a small chisel or osteotome into segments, two-thirds of an inch in thickness. These extract with greater facility than the former irregular fragments. After the removal of the upper part of the head, the femur is strongly rotated outward, and all the cartilage that can be reached on the anterior aspect of the remaining portion of the head is removed with a chisel. Then the same instrument is inserted between the head and the acetabulum and the cartilage on the contiguous surface of the latter is destroyed as much as possible. In stout people one is forced to rely upon the sense of touch, almost exclusively, when removing bone. One precaution should be emphasized, and that is, not to be misled by the shell of the osteophytes, which often extends a considerable distance outward and downward from the rim of the acetabulum, and remove too much of the head. The tendency is always to think of the hip joint as situated lower than it is.

Case 2. A. N. consulted the writer September 14, 1906. Before a question could be asked, the patient volunteered the diagnosis. He said that his right hip had been fractured fifteen years before. The following history was obtained: Age 30; always well. No trouble with joints before injury. Was struck on right hip with a stone the size of a goose egg, thrown by his brother, fifteen years before. Careful questioning brought out the fact that he walked home after the injury, and did not have any trouble in the hip for over a year. The first symptoms were stiffness, slowly increasing, until pain appeared about one year and a half ago. Since then, notwithstanding much treatment by many physicians, the symptoms have increased in severity until two months ago, when he was compelled to discontinue work. Sleep has been much interfered with on account of pain.

Physical examination. Pale and careworn. Walks with a marked right limp. No other joints involved. Actual shortening of right leg one-third of an inch. Practical shortening, one and one-half inches. Rotation and abduction of thigh much limited by pain and obstruction. Flexion to 100 degrees. Hyperextension much limited. Some spasm of muscle. Atrophy of

Case 4.

the limb was marked. The buttock was flaccid and flattened. A skiagraph showed the head much worn away and flattened, with many osteophytes about the rim of the acetabulum.

The patient was put to bed with traction of five pounds and the hip immobilized. The pain promptly disappeared, and at the end of two weeks a short spica was applied and the patient was allowed to go about with the aid of crutches. This was very annoying to patient, and he refused to wear the spica. A brace was advised, but was refused. Patient was not seen again for over a year. When he reported, he had been taking some injection treatment in hip, and was much worse, both in respect to pain and disability. He was admitted to the Post-Graduate Hospital, November 25, 1907, and was immediately operated. This patient at the present time is walking about without pain and has been to work for several months.

CASE 3. M. G., 55 years old. Clerk in store. Consulted the writer December 15, 1907. Five years before patient fell, striking his back on sidewalk. Soon afterwards he noticed slight stiffness in right hip. He was never able to run since without a noticeable limp. There was little change until the fall of 1905, when a severe pain was experienced in hip, while patient stooped to pick up something. Since that time, the pain and disability were much worse. In January, 1906, he went South, but the hip became more painful while there. Three months after his return home, he was compelled to begin the use of crutches. Soon after this there was some improvement, but a cane was always used thereafter, and a constant dull ache in hip was always present.

Physical examination. Pale and rather poorly developed. Weight 150 pounds. Walks with a marked limp. Right leg much atrophied and somewhat permanently adducted and flexed. Flexion of thigh about one-third its normal arc. Abduction and rotation nearly absent. Hip sensitive to the limits of all passive motions. Actual shortening of right leg was one-half an inch. Practical shortening, one and one-fourth inches. A skiagraph showed that the head was much worn away, with some osteophytes about the rim of the acetabulum.

This patient was operated December 22, 1907. The convalescence was uneventful. The plaster-of-Paris spica was removed at the end of twelve weeks. The patient went back to work ten weeks after the operation. He has had no trouble with the hip since.

CASE 4. T. J., 67 years old. Carpenter by trade. Never in bed on account of sickness. Gonorrhoea when 22 years of age, from which he has had no trouble in the past fifteen years. Present trouble with right hip began ten years ago. The first thing that the patient noticed was that his right hip began to be stiff when he stopped to pick up something or to lace his shoes. The hip from that time gradually became stiffer. As he put it, "the muscle seemed to contract." Three years ago the hip became painful. The pain has been worse during the day, but has also interfered with sleep a good deal at night. It has increased continuously since its beginning. The apparent shortening of the limb and the lameness have been marked during the past six months.

Physical examination. Careworn, and beyond his years in looks. Walks with a marked right limp. Right leg atrophied and adducted. Buttock flattened. All motions of hip, including rotation, much limited, especially abduction. Flexion was the least limited and was about one-third its normal amount. The hip was sensitive to the limits of all motions. Actual shortening five-eighths of an inch. Practical shortening, one and one-fourth inches.

This patient was admitted to the Post-Graduate Hospital (private floor), February 5, 1908. He was operated February 7th. The skiagraphic findings were confirmed. The head was much worn away and there were many osteophytes. As in the previous cases, there was practically no post-operative shock. The convalescence was uneventful. Four weeks after the operation, he was shown to the Interurban Orthopedic Club, and at that time he was wearing a short spica and walking with the aid of crutches. He could stand on the operated leg without pain. Two months after the operation, he wrote to his nephew that he was walking about with comfort, and that occasionally the entire weight of the body upon the operated limb produced a twinge of pain, but that he was free from pain at all other times. November 12, 1908, he again reported by letter that he was working on a farm in Pennsylvania, and that his hip was strong and had not troubled him for a long time.

CASE 5. J. K. Referred to the writer by Dr. A. W. Hollis, of New York. A previously active business man, 63 years of age. Past history negative. Twelve years ago, a sidewalk over which patient was walking broke, letting his right foot through. The right hip received a "severe jar." Soon after this, he began to have pain in the knee and thigh, especially while walking. Ten years ago, he began also to have pain in the region of the right sciatic nerve. This has also gradually increased in severity. Three years ago a severe pain began just posterior to the hip joint. This continued to increase until for the past three months the patient was practically confined to his chair or bed. He lost interest in things and refused to go about, and retired from business.

Physical examination. Very large. Height 5 feet, 11 inches. Weight 220 pounds. Right thigh much atrophied and adducted. Walked with difficulty, hopping along as if it was very painful. Flexion limited to about two-thirds its normal arc. Abduction and rotation nearly absent. Limb adducted. Actual shortening three-eighths of an inch. Practical shortening, one and one-half inches. Joint sensitive to the extreme of motion. Patient locates most severe pain as just posterior and internal to the hip joint. He was admitted to St. Luke's Hospital, Private Pavilion, by the kindness of Dr. Lyle. The operation was done February 20, 1908. The head had slipped up on the rim of the acetabulum and was apparently progressing toward a complete dislocation. There were many osteophytes and much disorganization of the joint.

The convalescence was uneventful. This wound, as well as all the others, healed by primary union. The patient was walking with the aid of crutches at the end of four weeks, and could place his whole weight upon the operated leg without pain. The spica was changed to a short one at the end of five weeks. It was removed at the end of eleven weeks. This patient was seen June 1, 1908, when he stated that he had not experienced a twinge of pain in his hip since the operation. His family stated that he had undergone a great change mentally since relieved of his constant pain, and that he was much more cheerful than formerly.

In a letter, January 12, 1909, the patient states: "I am very much pleased to be able to report that the operation has been a wonderful success. All pain has left me, and you may remember that I was very anxious about my right knee joint, which has pained me so many years and I feared might have become chronic, but now this knee is as strong as the other, and entirely free from pain. I can walk all day if necessary. The result from the freedom from pain allows me to attend to my business and I feel at least twenty years younger."

CASE 6. M. H., female, 45 years of age, was admitted to the Post-Graduate Hospital and operated August 7, 1908. This proved to be an advanced case, and the joint was much disorganized, with a marked flexion-adduction deformity. The wound healed by primary union and the convalescence was uneventful for the first seven weeks. When I went away on my vacation September 7th, she had been about the ward on crutches for ten days and was planning to go home within a few days. Soon after this she began to have a temperature. Medical consultation made a diagnosis of pneumonia and chronic diffuse nephritis. She showed very little resistance, became delirious, and died in about ten days. The autopsy showed a collection of pus near the hip joint. The report of the urine before the operation was negative, but directly afterwards albumin and casts appeared, varying in amounts, but persisting. Diagnosis of pathologist, chronic diffuse nephritis.

Case 7. Note bend in the femoral shaft at the point of the former Gant's osteotomy.

CASE 7. Miss B. Eighteen years of age. Was admitted to the Post-Graduate Hospital, August, 1907, and a diagnosis of ankylosis, with flexion-adduction deformity following tuberculosis was made, and a Gant's osteotomy, with correction of the deformity, was done. The immediate convalescence was uneventful, but when the patient began to walk, weight bearing produced pain, and a short spica with crutches was instituted again, but to no avail. An X-ray one year after the operation showed the bones well united at point of operation, but there was slight motion at the hip joint, indicating that the ankylosis was fibrous and not bony, as was supposed, which, by the way, is very likely to be the case in tubercular infection, and accounts for the frequent relapse of a deformity after a trochanteric osteotomy. In this case then, we had an analogous problem to that of a knee joint in a similar

Case 10.

condition with its contingent joint strain, the universal treatment of which is an excision for ankylosis. After palliative treatment for one year and ten months, without relief, a partial arthrectomy, as described herein, was done June 1, 1908. The hip was found much disintegrated, but the ankylosis was fibrous. The convalescence, in a neurotic girl, has been uneventful, and a firm bony ankylosis has been secured.

CASE 8. E. A., laborer, 38 years of age. Admitted to the Post-Graduate Hospital, August 20, 1908. Family and previous history negative. One year ago began to have pain in posterior part of the left thigh, groin, and knee. Pain increased to such a degree in two months that he was confined in bed for one month. Since that time the pain was continuous but intermittent in its severity. There was one-fourth inch shortening, considerable flexion, and adduction. Pain and much spasm produced by passive motion. Motion limited, equally in all directions, by spasm. Patient objected strongly to braces or spicas, and stated that he had a large dependent family. A partial arthrectomy was done August 21, 1908. He was discharged from the hospital October 24, 1908, in a short spica, which he immediately cut off, and objected to its being replaced. Nevertheless, the limb has remained in good position, and there is apparently firm ankylosis. I wish, however, to state here that this treatment should be recommended for very carefully selected cases of tubercular hip disease, and in adults only.

CASE 9. A. S., adult female, 29 years of age. Was kindly referred to the writer by Dr. R. A. Hibbs, of New York City. History negative except for present illness. Began to have pain and stiffness in left hip fourteen years ago. Etiology unknown. Disability and pain increased, until two years ago, when it became much more severe both night and day. Has had to use crutches and one and one-half inches of cork extension on left shoe for the past two years.

In the past six years, this patient has been discharged as incurable from two hospitals, and has been under treatment without relief in either the wards or dispensaries of the following hospitals: The New York Hospital, The Post-Graduate Hospital, Christ Hospital in Jersey City, Roosevelt Hospital, The Hospital for

Case 11. Note the extreme wearing away of the head in an oblique plane. In this case the portion of the head was removed through a plane at more of an angle with the femoral neck, on account of the obliquity of the head.

the Ruptured and Crippled, and the Vanderbilt Clinic.

Physical examination was negative, except left hip. Walks only with the aid of crutches. Wears one and one-half inch extension on left shoe. The left leg is markedly adducted and flexed about forty degrees. The actual shortening is one-third of an inch, and the practical shortening two and one-half inches. All motions absent except about ten degrees of flexion. All attempts at passive motion elicit severe pain. An X-ray examination revealed many osteophytes, and the head much flattened.

This patient was admitted to the Hospital for the Ruptured and Crippled, where the writer operated February 23, 1909. The convalescence has been uneventful and all pain and discomfort have disappeared. The disability is much relieved and patient walks without the aid of crutch or cane.

CASE 10. L. C., adult male, 28 years of age. Plasterer by trade. Venereal history negative. For several years has had pain in left hip. Etiology unknown. Two years and a half ago was treated for rheumatism of this hip. Later, wore plaster-of-Paris spica without relief. For the past year, the pain and stiffness have increased rapidly. Has not been able to work for the past six months.

Physical examination negative, except for left lower extremity. Walks with difficulty and much pain. Limb permanently adducted five degrees and flexed thirty degrees. All motion much limited, especially rotation and abduction. There are about thirty degrees of flexion, obliquely outward. The extremes of all motion cause pain. The actual shortening is one-fourth of an inch. The practical shortening is one-half of an inch. A skiagram showed osteophytes and a flattened head.

This patient was admitted to the Post-Graduate Hospital and operated February 26, 1909. He was discharged April 15, 1909, and at that time there was slight motion at the hip, which caused some pain from weight bearing. A month later, firm ankylosis had occurred and the pain, when walking, had entirely disappeared. At this writing, the patient is back to work, and is much pleased with the result.

CASE 11. E. E., male, 28 years of age. A silver burnisher by trade. Duration of progressive pain and stiffness in right hip ten years. No history of injury. The pain is more severe the past two years, especially at night. The past year he has been much crippled. Has worn a cork extension of two and one-fourth inches the past three years.

Physical examination negative, except for the right

Case 14.

limb. Patient stands with foot raised from the floor, on account of the presence of extreme adduction and about thirty degrees of permanent flexion. The limb is markedly atrophied. All motion practically absent, except about ten degrees of flexion. Attempts at passive motion produce pain. An X-ray examination revealed osteophytes and a much flattened head.

This patient was under the usual palliative treatment for a year without relief. He was admitted to the Post-Graduate Hospital and operated June 17, 1909. The operation was witnessed by several members of the American Orthopedic Association. The convalescence has been uneventful thus far.

CASE 12. M. P., male, 22 years of age. History negative until the beginning of the present illness. Four years ago he began to have pain and stiffness in the right hip. This gradually increased with the associated disability, until three months ago, when the pain became much more severe and he could not move about without great discomfort.

Physical examination negative, except for the right limb. Patient walks with marked right limp. All motion much limited, especially rotation and abduction. There is motion of twenty degrees of flexion. Limb permanently adducted five degrees and flexed ten degrees. All attempts at passive motion elicit pain. The actual shortening is one-fourth of an inch, and the practical, one inch. An X-ray examination showed many large osteophytes about the acetabulum and the head much flattened.

This patient was admitted to the Post-Graduate Hospital and operated upon July 16, 1909. The convalescence has been uneventful.

CASE 13. T. W., male, laborer, 60 years of age. Family history negative. Personal history negative. In November, 1908, had a severe fall striking on right knee. The force of the fall was transmitted to the right hip. Pain and stiffness have gradually increased ever since. Has not been able to work the past nine months and has had to use crutches or cane during this time.

The physical examination is negative except for the right hip. He walks with a marked limp and only with the aid of a cane. Foot much everted and leg considerably atrophied. There are slight adduction and flexion. Rotation and abduction nearly absent. Flexion to about sixty degrees, associated with marked muscular spasm. The actual shortening is one-fourth of an inch. Practical, one-half. An X-ray examination revealed many osteophytes about the hip and the femoral head considerably flattened. The convalescence has been uneventful thus far, after having been operated at the Post-Graduate Hospital on August 4, 1909.

CASE 14. B. C., male, 22 years old. History negative, except right hip. When patient was six months old he had a severe trouble with the right hip, which was pronounced by his physicians tubercular hip disease. He was under treatment with braces, plaster-of-Paris spicas, high shoe, and crutches continuously, until he was nine years old. Thigh has been drawn up ever since he can remember. For past ten years has worn three and one-half inches of cork extension on right shoe. Has been quite free from pain until five or six weeks ago, when he began to have pain in hip while walking. No pain at night. Health otherwise good.

Physical examination. There are three and one-half inches of cork extension on right shoe. Patient walks very poorly with toe turned in and marked limp. Right trochanter is very prominent and above Nelaton's line. Right limb is extremely atrophied and poorly developed. Marked permanent adduction and about forty degrees of flexion. All motion at hip joint is absent except for about five degrees of flexion, associated with pain and muscular spasms. The actual shortening is seven-eighths of an inch. Practical shortening is three and three-fourths inches. An X-ray examination showed the head somewhat worn away and very large osteophytes at the upper part of rim of acetabulum. A diagnosis was made of an old tubercular hip with a complication of osteoarthritis. The herein described operation was chosen instead of Gant's osteotomy, because of motion at the hip and its associated joint strain, and liability of a relapse of the deformity after the former operation. This patient was admitted to the Post-Graduate Hospital August 5, 1909, and immediately put to bed with ten pounds extension, with the hope of stretching down some of the enormous adduction. August 6th, he was anæsthetized and the hip stretched. The join was then reached by the usual route, and about one-third to

one-half of the head was removed. A larger portion than formerly was removed on account of the marked adductor contractures. However, even then, sufficient abduction could not be secured, and an extensive open myotenotomy of the adductors was done. The limb was then put up in a long spica in very good position, i. e., ten degrees of flexion and abduction. The convalescence thus far has been uneventful.[1]

The writer believes that the field of this procedure should be extended to include besides the above mentioned cases of advanced arthritis deformans, certain selected cases, such as extreme paralysis of both hips and the lumbar spine (dangle hips), associated with marked lordosis, where contractures of the fascia lata occur and recur. Here the ankylosing of one hip holds the pelvis upright, corrects the lordosis and makes bracing much easier.

Second: Dislocations following suppurative arthritis of infancy, where the head of the femur has become disorganized and has disappeared. In this event, the great trochanter should be mortised into the acetabulum.

Third: As a substitute for Gant's subtrochanteric osteotomy in cases of fibrous ankylosis, where mobilization is not feasible. This precludes two disagreeable sequences of Gant's osteotomy, namely, joint strain, and relapse of the old deformity, by a slowly giving way or stretching of the fibrous ankylosis. In other words, it is treating the hip as the knee joint has been treated, under similar conditions, for years.

Fourth: I believe it has a place in the treatment of select cases of tubercular ostitis of the hip in adults, and I would again refer to the accepted views as to the application of an excision to the knee joint, as a guide in the selection of these cases. It should, however, be noted that this procedure is somewhat more permissible in older children than an excision of the knee, (1) because a very little of the epiphyseal cartilage is removed, and (2) much less growth occurs here normally than at the lower end of the femur.

The above described operation, in the light of the sixteen cases herein reported, has the following advantages:

First: It assures bony union by bringing two large bony surfaces into close apposition and holds them there firmly by the mere correction of the deformity, if one exists, thus eliminating all possibility of a painful joint or a recurrence of the deformity, either of which are probabilities in the event of an operation for mobility. Further, the stiff hip, in the position of fifteen degrees of flexion, with the compensatory movement of the lumbar spine, has proved of very slight annoyance in every case.

It should be noted here that the distance between the horizontal planes passing through the upper part of the hip joints and the intervertebral cartilage between the sacrum and the last lumbar vertebra, is approximately only two and one-fourth inches; hence the satisfactory compensatory mobility of lumbar spine.

Second: It produces a minimum amount of bony shortening, which is compensated for, as well as that already existing, by the fixed abduction of the limb.

Third: It involves very little cutting of soft tissues and does not require the dislocation of the head from its socket, and thus produces very little post-operative shock, even in old people.

Fourth: A dislocation or displacement of the femur is extremely unlikely, even from weight bearing, immediately after the operation. Therefore, aged patients can be gotten out of bed very early.

[1] The additional cases will not be given in detail. They were both advanced osteo-arthritis of the usual type and were forty-two and fifty five years of age. Their convalescence has been uneventful. The results are extremely satisfactory. Their pain has entirely disappeared.

CONCERNING THE FERMENT AND ANTIFERMENT TREATMENT OF SUPPURATIVE PROCESSES[1]

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DURING the past year, I, together with A. Peiser, made at the thirty-seventh congress of the German Surgical Society, the first communication concerning a new form of physiological therapy of suppurative processes, which, both theoretically and experimentally, is well grounded, and with proper indications can lead to surprising practical results.

It is the so-called ferment and antiferment treatment. The end result of this therapeutic endeavor is produced by the changing relation between the albumen dissolving enzyme, which even normally is contained in the polynuclear white blood corpuscles and the antibody, which, as an antiferment to this proteolytic leucocyte ferment, circulates in the blood serum and also passes out into certain pathological exudates, especially into certain fluids obtained by aspiration from the pleural and peritoneal cavities.

We have demonstrated this antagonistic play between ferment and antiferment, which, on account of their marked biological differences, so-called cold, clear, tuberculous pus and so-called ardent, acute, inflammatory coccus pus show on the serum plate. A simple experiment to illustrate albumen dissolving ferment consists, namely, in that one places small drops or particles of the material to be tested on a so-called Loeffler's or serum albumen plate and incubates the latter at a temperature of 55° to 60° C. Deep excavations appear in the serum plate when the excretory material contains a ferment which is capable of dissolving coagulated blood serum. In the absence of such a contained ferment cavity formation fails to appear. Now "ardent pus" produces on such a serum plate deep cavities; not, however, by means of the bacteria which it contains. On the other hand, cold pus simply dries out on the unchanged surface of the serum. The pus corpuscles of the ardent pus are, of course, polynucleated neutrophilic leucocytes, and therefore ferment carriers. The cold, clear, tuberculous pus consists, on the other hand, mainly of detritus and lymphocytic elements which seem to contain no ferment. Every secondary infection, however, causes the cold pus to contain ferment and, therefore, in a certain measure to become ardent. The ferment carriers are here also immigrated polynuclear leucocytes through the disintegration of which the enzyme becomes free and active.

Its action can, however, become weakened or prevented by the thermolabile antibody, the antiferment. Indeed, for example, the addition of an equal quantity of richly albuminous ascitic fluid, can occasionally, even in dilutions of many hundred fold, promptly inhibit entirely the action of digesting coccus pus.

I have previously emphasized further that the polynuclear leucocytes, as ferment carriers, not only lead to excavations on such serum plates; they lead also to destruction of albumen in the pus cavity itself. The albumen destruction must, on account of the lack of an adequate amount of proteolytic ferment, be proportionately very slight in pure tuberculous processes. On the other hand, it must be very great in acute inflammatory and ardent suppurations, on account of their richness in enzyme.

The fermentative destruction of albumen is, however, not only the most important preliminary process in resorption: it is also the cause of the so-called suppurative tissue dissolution, which in reality is a purely chemical process. With this point in view I have endeavored, by addition of ferment, to make enzyme-poor tuberculous exudate capable of resorption and by addition of antiferment to diminish in ardent pus an excessively rapid

[1] A report given before the Surgical Section of the International Congress held at Budapest, 1909. Translated by R. C. Menzies, M. D., Assistant in Surgery, Northwestern University Medical School.

absorption of toxic products of metabolism and a too extensive tissue dissolution.

The ferment treatment of cold pus was previously known. The curative action of the iodoform glycerine injection depends indeed on the fact that the iodoform has a chemotactic action. Through the albumen dissolving ferment of immigrated and disintegrated leucocytes the albumen becomes dissolved and capable of resorption, while with untreated, closed, pure tuberculous processes as has been already mentioned, all proteolytic ferment action on serum plates is absent, yet there can also occur with pure tuberculous processes unmistakable digestive phenomena (viz., cavity formation) when the process is under the influence of iodoform glycerine treatment. In contrast to this known indirect ferment treatment I endeavored to inject pure ferment solution, but without being able to report practical results.

This direct ferment treatment of tuberculous processes has at a later date and independently of me been investigated with great success by Jochmann and Baetzner in Bier's clinic. They employed for this purpose not the difficultly obtainable proteolytic leucocyte ferment, but the biologically apparently equally valuable pancreas trypsin, in a solution of about one per cent. About one to two cc. of this solution are injected as a rule, repeatedly and at varying intervals of time, according to the usual method of injection treatment, into the tuberculous cavity.

The abscess content under this treatment changes gradually in color and consistency. In the first place, owing to disintegration of the formed pus elements, it becomes more fluid. Of more importance than all else, however, there soon springs from the periphery, toward the center, a vigorous wall of fresh live granulation tissue.

In this manner the abscess cavity is gradually filled in and brought to scar formation; apparently the injected trypsin ferment is capable of attacking and digesting the weakened tuberculous granulations. The healthy granulation tissue is, on the other hand, in consequence of its adequate content of antiferment, protected from heterolytic digestion and at the same time through irritation from the injection and through removal of the previous inhibition, accompanied as it is by favorable local hyperæmia, it is made stronger and incited to vigorous development.

Also the injection into actively suppurating fistulæ and the swabbing of ulcerated open surfaces with the ferment solution proved practical therapeutic procedures. Tendon sheath hygroma. which without previous puncture are treated with the injection of ferment, soon become smaller and as the only sequence there remains behind a leathery infiltration of the sheath wall.

Whether this direct treatment of tuberculous processes is always preferable rather than the indirect by means of chemotactic agents, for example, by means of iodoform glycerine, further experience must decide. Against the injection of solutions of the ordinary digestive trypsin one may for example argue, that these commercial preparations are not at all sterile. The manner in which they are obtained involves the possibility of contamination with dangerous infectious bacteria, especially tetanus. In my opinion one is justified in injecting such a trypsin solution into a cold abscess only on condition that there has been a careful removal of bacteria by means of a germ proof filter. Even greater protection against tetanus is afforded by the trypsin solution (Merck) now used by us in Marburg, which is obtained under strict aseptic precautions from the pancreatic glands of animals.

The domain of this ferment therapy is, of course, on both theoretical and experimental grounds, tuberculous processes; yet it may be of value also in other local pathological lesions, especially in softening up diphtheritic membranes. The use of pyocyanase is a form of ferment therapy. One great advantage of this pyocyanase obtained by fluid culture of the bacillus pyocyaneus should lie in its possession of an albumen dissolving ferment shown by its proteolytic power of dissolving membranes.

The main point in a physiological therapy, hence in a nature cure of suppurative processes, lies not alone in the fact that one employs to the utmost and when possible even increases the natural curative and protective powers of the human organism. It lies also in the fact that we limit single, especially fermentative

resistance endeavors to a suitable and permissible degree and thereby curb the blind zeal of nature in her attempt at protection. The cold, sterile, tuberculous area is entirely too lacking in ferment. It requires therefore, for resorption and healing the artificial addition of ferment. On the contrary, in ardent suppurative processes there is an excess usually in the amount of pus secretion and in the amount of pus fermentative tissue dissolution. Against its albumen dissolving ferment: hence against self-digestion in the broader sense, the body protects itself normally by means of its antiferment. The addition of antiferment to the ardent pus area oversupplied as it is with enzyme is from this viewpoint therefore, the most natural and logical therapy. Artificial addition of antiferment to ardent pus causes it in a certain measure to cool. The excessively active destruction of albumen through the proteolytic leucocyte ferment is limited. In consequence the body tissue, immediately bordering and damaged in its vitality is protected from fermentative softening, or in other words from digestion by the pus. In this way one is able most successfully to combat the occurrence of serious functional defects through wide extension of the tissue necrosis, and in like manner the perforation of pus into inner organs and general septic infection.

Moreover the artificial addition of antiferment must favorably influence the metabolic interchange between the pus area and the body. It must hinder the too quick and too extensive resorption of the excessively toxic products of albumen dissolution which occurs through the autolysis of the pus corpuscles themselves, through the fermentative dissolution of the necrotic body tissue, and last but not least, through the heterolytic digestion of the dead bacteria with production of so-called bacterial protein. Through it an easily imagined general intoxication of the body is best prevented and in addition the ferment fever (pus fever), caused as it is by resorption of toxic products of metabolism, must fall. Finally the limitation of excessive pus secretion and above all, the augmentation of the protective power of the leucocytes, must go hand in hand with the protection of the tissue and the diminution of resorption. In other words the enzyme containing leucocytes which normally circulate in blood serum rich in antiferment quickly undergo disintegration in the pus serum overloaded with ferment, hence in the products of their own metabolism.

Thus addition of antiferment protects the vitality of the leucocytes and preserves for the body one of its most effective weapons against bacterial infection. Such an artificial increase in the supply of antiferment belongs indeed to the healing factors of Bier's hyperæmia. A far more productive action must, however, result in circumscribed suppurations from direct flushing with fluids of high antiferment content. Such fluids are, first of all, human blood serum and certain aspiration fluids, especially from the pleural and peritoneal cavities. Now such solutions of antiferment contain not only the antitryptic substance which is necessary first of all. They contain also nearly all the other nourishing and protective substances which a tissue injured by bacterial suppuration requires for its defense. Wright's assertion that at the point of infection the concentration of protective material is diminished holds good apparently for suppurative processes and the thermolabile protective material. Above all the leucocytes in excessive amounts seem to inactivate opsonin (Böhme). When, therefore, in suppurative exudates the abscess content actually becomes lacking in normal protective serum nothing better can be done than, after removing the pus as thoroughly as possible, to introduce new protective serum. This is accomplished either through of a serous transudate into the pus cavity, an action brought about by the marked impairment of the circulation of the tissue fluids in consequence of the inflammatory changes in the vessels, or, still better, through direct artificial introduction into the abscess cavity of large amounts of blood serum and other aspiration fluids rich in antiferment. Thereby we produce immediately a local mass action of our protective force and at the same time the adequate addition of cell nutrient material necessary for the resisting ability of the cells.

As a therapeutic aid the blood serum was employed indeed by Metchnikoff. He used it locally in order to increase phagocytosis.

Hort in England has seen excellent results from similar local application of serum to ulcerative processes. Apparently, however, Hort reported results only from normal serum, that is, from serum normal in the sense that that of the patient does not contain sufficient "antipower" to hinder the autolytic processes accompanying suppurations. In his communication Hort also confirmed the result of the investigation carried out here in the Strimpel clinic by Wiens at my instigation. Wiens had made the first systematic study of the fluctuations of the antiproteolytic power of human blood serum in pathological conditions.

Then after Brieger and his co-workers, in verification and extension of our investigations and in application of our plate experiences, attached a certai n diagnostic importance to the increase of the inhibitory power of the blood serum in carcinoma,there accumulated in a very short time a quite extensive literature dealing with this subject. The most important and indeed the only sufficiently verified results of these studies are briefly as follows: (1) The inhibitory power of the human blood serum corresponds in activity to the activity of pancreas-trypsin and of the albumen dissolving leucocyte-ferment. (2) These same antitryptic ferments control, for example during pregnancy, the chorion trypsin elaborated by the young chorionic villi. (3) That we have to deal with several proteolytic ferments and that we must reckon not alone with primary fluctuations in the ferment production, for example, with increased and decreased destruction of leucocytes, but also with primary fluctuations in the content of antiferment; and finally (4) with the fact that the body answers to every increased addition of ferment with a reactive increase in its content of antiferment, so that without further evidence it is clear that the fluctuations in the inhibitory power within the range of the normal and pathological can be produced by widely.differing causes.

Concerning the normal fluctuations in the inhibitory power of the blood serum, which apart from pregnancy and labor are apparently only relatively slight, we know much less than we do concerning the changes in the fractional inhibition in pathological conditions. In most chronic and in practically all acute febrile affections the fractional inhibition in the human is influenced first of all by the proteolytic leucocyte ferment. In those acute febrile conditions which are accompanied by a leucocytosis, the increased destruction of ferment containing leucocytes can lead to a transient diminution of the inhibitory power at the height of the disease, and later to a timely reactive increase. On the other hand, in chronic diseases we must reckon with an increase of the inhibitory power as the result of a more prolonged though no less great increase of the ferment production, and a reactive immunizing increase of the amount of antiferment. And this indeed, is the fact. With the exception of diabetes mellitus, practically all of the more chronic diseases which are associated with serious general damage to the system, lead to an increase in the inhibitory power. This holds good also, though not without exception, for the majority of patients with carcinomata. In a given case, however, no great diagnostic conclusions can be drawn from this fact. One finds such an increase to a certain degree as an individual peculiarity, occasionally indeed in healthy persons, and quite regularly, as has been already mentioned, in other chronic diseases, for example, in severe cases of tuberculosis and Basedow's disease, in some severe cases of anæmia, and above all in most of the subacute and chronic septic suppurations.

The most that one can say, therefore, at least according to my experience, is that with a suspicion of otherwise uncomplicated malignant disease, especially of the gastro-intestinal tract, a normal or still more a markedly diminished concentration of the inhibitory power points to that diagnostic conclusion which speaks against the anæmia of carcinoma. A review of the investigations attempting to explain this increase of the antiferment content in malignant diseases lies outside the scope of my report. This increase I will say briefly is in no way a simple increase of inanition. The raised inhibitory power of the blood serum is in reality more the consequence of a chronic overproduction of proteolytic leucocyte ferment, and in consequence, a reactive immunizing increase of the antifer-

ment content. Only those carcinomatous patients who are cachectic have as a rule a distinct increase of the fractional inhibition. The cachexia, however, according to all clinical experience runs in the main parallel to the ulceration of the malignant tumor. The tissue destruction of the ulceration gives rise therefore in reality to the proteolytic leucocyte ferment. In my opinion there does not exist a special proteolytic carcinoma ferment. The carcinoma cells (as has been recently verified by Hess and Saxl in a late report) in regard to their ferment content react exactly like normal epithelial tissue. The cancer tissue has no special heterolytic enzyme, or in other words, no enzyme which digests the albumen of other organs. It obtains its heterolytic peculiarity only secondarily through the immigration of ferment carriers, that is, of neutrophilic leucocytes.

Be that as it may, the fluctuations in the inhibitory power of human blood serum under pathological conditions are in no wise of such a nature that they require in antiferment treatment the employment of normal serum. In acute suppurations the diminution of inhibitory power is as a rule unimportant. Frequently, indeed, there can even be recognized in subacute processes a favorable reactive increase in the content of antiferment. One can, therefore, in case other material is not at hand treat the patient with his own blood serum after venous aspiration of at most 100 to 200 cc. Whereas, therefore, Bier, through hyperæmia in a certain measure concentrated the protective power of the blood at the point of suppuration, we in employing the antiferment draw off the blood serum from a distant part of the body, through a venesection which is perhaps even in itself favorable, and introduce it, with production of a transitory mass action, artificially into the area of suppuration.

Such a venous aspiration is, however, especially in the presence of septic wounds, a proceeding to which patient and physician do not willingly resort. Moreover, the necessarily rapid and complete defibrination of the aspirated blood is not always an entirely simple matter at the bedside. We have ourselves therefore, made use therapeutically of our experimental experience that the antiferment passes out in large amount into certain human aspiration fluids, and from at first and exclusively, and indeed with very gratifying results, have treated our patients with alien aspiration fluids, from the pleural and peritoneal cavities. The therapeutic value of these fluids is all the greater because of the fact that their development in infections of serous membranes represents a curative attempt of the system and in a way a natural antiferment therapy.

Indeed, we have to thank only the rapid development of a richly albuminous and therefore powerfully inhibitory inflammatory exudate, when in spite of infection of the serous cavities with virulent bacteria the body comes out victorious and the dangerous surface suppuration is checked. Thus nature is here also our teacher.

For such an antiferment therapy there can be used in the first place from the pleural and peritoneal cavities, human aspiration fluids of an inhibitory power which equals or exceeds that of the normal human blood serum. The important considerations in choosing these fluids are briefly as follows: The differences in the content of antiferment and therefore in the inhibitory power of such aspiration fluids are explained by differences in the amount of contained albumen and by variations in the participation of the polynuclear leucocytes in the pathological process.

One can say in general, that the greater the albumen content of an aspiration fluid and at the same time the less the participation of the ferment containing polynuclear leucocytes in the pathological process, especially the less the disintegration of leucocytes, the greater is as a rule the inhibitory power. Through this fact is explained no doubt the surprising differences which one finds in methodical investigations of the ferment and antiferment content of aspiration fluids. An excess of free proteolytic leucocyte ferment in pleural and peritoneal fluids occurs only in those exudates which are the result of acute suppurative inflammation. In this condition there occurs a disintegration of such masses of leucocytes that after complete neutralization of the inhibitory material which is at the same time present, there remains an active excess of free

proteolytic ferment. A fractional inhibition which approaches that of the blood serum occurs on the other hand only in richly albuminous transudates and in certain exudates usually those resulting from tubercle bacilli and from other non-bacterial, that is, from not more bacterial chronic inflammations.

This antiferment therapy with alien human aspiration fluids carries with it, no doubt, important considerations. First of all, there is the possibility of transference of disease and thus always the disqualification of adequate amounts of a highly active human antiferment serum. Every transference of disease can indeed be prevented if one, after rejecting syphilitics gives preference to those aspiration fluids which are sterile in the first place and renders absolutely germ free every antiferment serum, not merely those which are recognizably infected, by passing them through a bacteria proof porcelain or clay filter. As a matter of fact, a really harmful associated action has apparently up to now been avoided. On the other hand, the elimination of immigrated bacteria through such a bacterial filter requires great care aside from the operative precautions. Moreover it does not entirely exclude the possibility of certain, although hardly more dangerous, injuries through unorganized toxic products of metabolism which are soluble in human aspiration fluids. By far greater difficulties, however, are encountered in the handling of large amounts of good, human antiferment serum. Certain aspiration fluids which can be made to retain their activity for a long time through being kept in the ice-box and through additions of preservatives, especially of small amounts of phenol, stand always at the service of large hospitals and clinics. For the surgeon hydrocele fluid is still most available. This hydrocele fluid, however, does not at all as a rule meet the requirements of a good antiferment serum, so that we have used it as a rule only in case of necessity and as an irrigation fluid preparatory to the use of a highly active serum, hence in a way as an adjunct serum. Only when the inhibitory power of the hydrocele fluid equals that of the normal human blood serum is it of full therapeutic value.

Certain unsatisfactory results with hydrocele fluid and similar material can therefore be blamed upon the antiferment therapy only when the presence of a sufficiently high antitrypsin content is proven by previous thorough determination of the inhibitory power.

On account of these difficulties in obtaining and in preserving ready for use sufficient quantities of sterile and strongly inhibitory aspiration fluids, the general use of the antiferment therapy can naturally be an entire failure not only in general practice but also in other special branches, for example, in gynecology and ophthalmology in which it has also been employed. We must demand, of course, of a good remedy that in addition to the exclusion of disease transmission it shall stand ready for use in sufficient quantity at all times and in all places. Only through the use of animal blood serum rich in antiferment could this aim be accomplished and thereby the general employment of this new curative method be insured. The blood serum of most of the mammals has, however, a much smaller inhibitory power against pus ferment than that of the human. It is therefore not in its natural state available for efficient antiferment therapy. Nevertheless the commercial preparation of a highly active animal antiferment serum is quite possible. In other words, repeated artificial injections of ferment produce a reactive increase of the antiferment content of the blood serum in animals Thus through systematic immunization of horses against human pus ferment, which was obtained from large quantities of ardent pus, we were enabled to obtain an animal antiferment serum of high inhibitory power. This immunization of animals through systematic injection of human pus ferment is however not very practical. In the first place the handling of large quantities of pus is hardly possible. Besides, this human pus in spite of all the chemical changes which it undergoes in the course of time is a rather disagreeable excretion. Now, therefore, since it has been shown that the inhibitory power of the blood serum against pancreas trypsin increases, and vice versa parallel with the fractional inhibition against pus ferment, it is indisputably possible for the animal antiferment serum known as "leukofermantin" to be obtained through immunization with

pancreas trypsin. Moreover, only the employment of such a commercially supplied, highly active antiferment serum of always constant inhibitory power makes it possible to secure satisfactorally comparable results in long series of investigations and in different clinics and hospitals.

I must not conceal the fact that the use of a highly active animal antiferment serum involves also certain considerations. With a high surrounding temperature its inhibitory power can after weeks and months become markedly weakened through autolytic processes which are in nowise checked by the addition of phenol. The antiferment serum should therefore be not too old and should be kept in the refrigerator. Further, human blood serum and human aspiration fluids rich in antiferment contain practically all of those nourishing and protective substances with which our body defends itself against bacterial infection. One can speculate over the question as to whether these associated activities are very essential and whether they pertain to animal blood serum in a measure approaching that in which they pertain to suitable human aspiration fluids. As a matter of fact, in the joint investigations with Peiser ,in Küttner's clinic I convinced myself beyond a doubt that the antiferment content really plays the most important role. The best and most uniform curative results can be obtained only through the employment of highly active sera.

The contention is not tenable that such antiferment solutions are perverted in the abscess cavity into a superior culture material for the disease producing organisms. This is true only of the serum which is coagulated and changed by heat. Otherwise such antiferment solutions bear unharmed in their activity the addition of disinfecting substances, especially phenol. Besides this the fresh unchanged serum contains antibacterial protective substances and finally, according to Metschinkoff, it incites the leucocytes to active phagocytosis.

It cannot be within the province of an internist to prescribe to you as surgeons the special indications and methods of application of this antiferment therapy. As an internist I must rest the main portion of my communication in a discussion of the theoretical and experimental ground work. Only to this length am I entitled to my own opinion. In regard to practical experience I must content myself with a very short report of the matter which has been rendered by my earlier coworker Peiser, and later by Kolaczek, Hagen, Baetzner, Goebel, Fuchs, Lenz, Kantorowicz, and others.

One fact of right weighty importance for the recommendation of a new therapeutic measure has been established beyond doubt — namely, that, apart from occasional harmless serum exanthemata, pernicious results from this antiferment treatment have up to the present time never been encountered. On the other hand the curative effect in all ardent suppurative processes which lead to abscess formation was almost without exception very gratifying. These circumscribed suppurations with sharply marked boundaries are therefore the domain of the antiferment treatment. In these cases the curative results have uniformly borne out practically what was promised theoretically. After exhibition of antiferment the wound healing assumes an entirely changed and in a way a healthy character. With a fall in temperature and a quick recession of the œdema there ensues a speedy cessation of the softening which has begun, and through the formation of fresh healthy granulation tissue comes a most rapid demarcation of the tissue necrosis. As especially characteristic of the antiferment therapy, my surgical co-worker, Peiser, has called attention to the beautiful picture of the quick sharp demarcation. Even after a single day, Peiser has often been able to remove from a fresh, clean, active red bed of granulations the whole mass of entirely fluid pus drops and portions of tissue already necrotic and therefore inevitably lost. The excessive purulent secretion — (and this is the most remarkable fact), often vanishes as at a single stroke and the wound surface continues to secrete only a scanty amount of clear serous fluid. This frequently quite startling cessation of further purulent secretion is an indication that the suppuration is maintained not so much by the bacteria as purely chemically through the local excess of proteolytic pus ferment.

On this account I venture the proposition

that in ardent abscesses the surplus of proteolytic leucocytes is often more dangerous than the bacterial content. And I firmly believe that the diminished resisting power of an organism against infection depends often less upon a want of protective power than it does upon the failure of our inhibitory mechanism to prevent an excess in the various protective endeavors.

You will justly remind me that the results of the antiferment treatment are valuable in just those suppurations or in other words in the very abscesses which offer the most favorable condition for healing by the usual surgical measures. Nevertheless the antiferment treatment has just here a double advantage. The healing period is actually shortened. Gagan, in addition, extols during this period the easy changing of dressings. Furthermore, the antiferment therapy seems to be indicated in sharply demarcated suppuration in the interest of special functional and cosmetic results, and because it can for example in joint infections substitute for a large incision a small one, or even treatment through a puncture wound. The pus ferment dangerous as it is in excessive amounts is evacuated by incision; by antiferment treatment on the other hand it is neutralized and rendered inactive. Under certain conditions an antiferment treatment may accomplish more than an incision. The serum can pass into the wall of the abscess and there protect the infiltrated and injured tissue (Rantorowicz).

Even upon theoretical and experimental grounds the antiferment treatment must fail in purely infiltrating suppurations and in more diffuse suppurative inflammations which like beginning furuncle and carbuncle have not yet gone on to the formation of a circumscribed suppurative area. The antiferment can indeed be active only when in the presence of already accomplished pus fermentative tissue softening it can, through reciprocal contact, form a direct chemical union with the enzyme. In order, therefore, that the antiferment act to its full extent it must be brought into the greatest possible extensive and intimate contact with the suppurating surface. I will once more briefly mention that the antiferment therapy has given the greatest satisfaction in actively secreting fistulæ of the soft parts which have for a long time resisted other treatment.

The scope of such an antiferment therapy is by no means confined to the special branches of surgery, gynecology, and ophthalmology. Theoretically, endeavors made from the same standpoint come under consideration also in diseases of the meninges. Especially in epidemic cerebrospinal meningitis, in the meningo coccus serum, made for which the antiferment content is by no means the least active ingredient. Furthermore, in brain abscesses when in spite of operative opening and drainage the suppurative tissue softening often continues to advance. Moreover in suppurative pleuritis and peritonitis, in suppurative pulmonary diseases in which the inhalation of finely vaporized antiferment solution comes in question, and last but not least, in ulcerative processes of the gastrointestinal tract. Why should one not as Hort in England has already done, attempt to administer by mouth as a nourishing, and at the same time physiologically protective remedy, an animal blood serum rich in antipepsin and antitrypsin, for the purpose of local antiferment treatment in ulcerative disease of the stomach? Blood serum is a very nourishing fluid and one which is rich in albumen and easy of absorption. The albumen of the blood serum in conjunction with its alkali is able to bind the surplus hydrochloric acid of the gastric juice, at the same time the contained antipepsin shields the ulcerated surface from pepsin and the antitrypsin protects it from the albumen dissolving leucocyte ferment. Besides we know from Weil that a normal blood serum is as in hemophilia an important aid in checking hæmorrhage.

I know full well that the last word concerning the value of the antiferment therapy of suppurative processes has not by any means been spoken. I must let myself be satisfied if to me is granted the knowledge that through a study of the biological processes of wound suppurations, viewpoints for a new and perhaps practically superior form of physiological therapy have developed, and it would especially delight me, if it were possible for us internists in this fruitful interchange of ideas with the surgeons, for once to give and not to receive.

REPORT OF FIVE HUNDRED CASES OF DIFFUSE AND GENERAL PERITONITIS FOLLOWING APPENDICITIS[1]

With a Plea for Early and More Complete Work

By J. W. KENNEDY, M. D., Philadelphia, Pennsylvania

(From the Clinic of Dr. Joseph Price)

PERITONITIS remains pre-eminently the most important subject which concerns the profession.

Although peritonitis has largely become the heritage of the surgeon, yet the operator's position and importance in this condition remains subservient to the general practitioner, and his mortality will largely be proportionate to the views and diagnostic ability of the family physician.

The more one sees of intraabdominal pathology the greater becomes our appreciation for the great worth of the skilled diagnostic ability of the general practitioner.

Any one with a considerable experience in the operative treatment in the various forms of peritonitis cannot help but have the greatest apprehension and feeling of insecurity when surrounded by a profession that has not been grounded in the importance of early recognition of all inflammatory conditions of the abdomen.

The young operator is so dependent upon the practitioner for his reputation that necessarily he has the strongest feelings for or against certain communities. He has learned from sad experience that he is being called to a neighborhood which waits until the undertaker's era has begun before asking for consultation.

Yet specialists should be charitable in their views toward the general profession for a late recognition of pathology, on account of the fact that surgeons are far from a unit in their views as to the time and manner of operative procedures.

Every deviation from first-hour operations in peritonitis establishes a precedent which permits the profession at large to view with alarming complacency, a rapidly progressive, and often fatal condition.

This permits me to ask this question: Has any one ever lost a patient from too early an operation?

My eight years' experience with Doctor Joseph Price commands me to answer this question in the negative.

This forces another question: Do we ever operate too late in peritonitis? The answer is a sad one.

The next logical thought is just this: Is there some safe period between the earliest and late operation? Right here is where the surgical profession is hopelessly divided, and ceases to be a stimulant to the medical profession.

Our surgical literature abounds in exhaustive compositions and discussions urging what they choose to call safe periods to operate. Any given number of operators may be united on first-hour surgical procedures when seeing the patient in the beginning of an attack of peritonitis; but this same number of operators on seeing the patient on the third, fourth, or fifth day of an attack of appendicitis (our most dangerous source of peritonitis), are uncomfortably divided in their opinions as to operation.

So we have fourth-day operators, fifth-day operators, and sixth-day operators. Can you blame the general practitioner for giving us late operations with high mortality?

It would seem practically useless to enter any discussion in regard to operative procedures until we have established some unity of opinion as to when to operate in peritonitis.

Dr. Price answered this question some years ago, and has consistently lived his surgical convictions with a mortality in peritonitis which challenges the world. He is perfectly unflinching in his views as to time to operate.

His dogma is, "Operate first hour at any stage."

This surgical aphorism has been the greatest comfort and protection to me of my professional life. It has given me any victories I

[1] Read in part before the Tri-County Medical Society of New Jersey.

have had, and any deviation from such teaching has been responsible for my lamentable failures.

This concise view, "Operate first-hour at any stage," is our only hope for a united profession in this terrible disease; the example will be so far reaching.

The early diagnosis will demand first-hour operations, which will then antedate the ice bag and opium treatment, and our reward will be a nil-mortality in most forms of peritonitis.

When you begin to make some differential discussion as to time to operate on the various sources of peritonitis, as to whether it is perforated appendix, suppurative gall-bladder or pyosalpinx on account of some sources of inflammation being more virulent than others, you only encourage later operations from each and all sources of peritonitis, and confuse the general profession.

If you possess a knowledge of distinction of virulence, among certain sources of infection, keep it to yourself, with the idea that it is not safe in the hands of even your friends. I repeat, there is no other possible solution of the question as to time to operate, than first hour at any stage.

Had the profession been united on this one question, it would have been impossible for me to report at this date, five hundred cases of diffuse and general peritonitis. Such report necessitates an apology to the laity and a rebuke to the profession. It must be convincingly evident that if we cannot be united upon the fact that no stage in peritonitis is too acute for operation, we must remain confusingly divided.

The strongest evidence we have that just such a condition of divided opinion exists, is this: During the last few years I have heard over a thousand practitioners and surgeons, representing every state and territory in the union, ask Dr. Price this question: On what day in appendicitis, salpingitis, or peritonitis do you operate?

If this question is answered by any other advice than that of immediate operation, you lay yourself open to an attack from several directions.

The profession must be given some definite time to unite upon in regard to surgical intervention in the acute inflammatory lesions of the abdomen. In order to bring about such a union, tangible signs and symptoms must be indicated to the general profession.

Any differential discussion as to time to operate in peritonitis, based upon any symptomatology, has been an utter failure.

Ask the general profession if they have an intelligent idea of any author's attempt to make a distinction of extent or nature of a peritonitis as applied to time to operate. Their answer is our greatest plea for first-hour operations at any stage.

For purpose of discussion: suppose you advise the inquirer to operate on the fifth or sixth day? This breeds confusion, as you will often be told that it was impossible to say just when the attack began.

Next, you must insure the patient and physician that all cases of inflammatory lesions proceed alike, and that on a certain day you expect the pathology to be at a definite stage.

Again, why have you a right to promise that there will be a fifth or sixth day, or a stage of quiescence? How are you safeguarding the patient?

Are signs and symptoms always proportionate to extent of interabdominal pathological conditions? Unless you have a better therapeutic ground for your operative inactivity in peritonitis than we are familiar with, you have no right to lapse into a stage of surgical lethargy in an active peritonitis.

If surgically you must grow apathetic, and hope and Christian Science must enter your professional career, please do not mix it with peritonitis. They are incompatible.

It is true without any possibility of denial, that the operator who waits for a stage of quiescence in peritonitis from any source, has no stronger foundation for such procrastination other than hope and trust (unsurgical terms), and reaps more peritonitis and death.

I do not want to be understood as saying that there is no such era of quiescence in some cases of peritonitis, as we have all seen subsidence of acute symptoms; but I do mean to take this stand: that you have no right to anticipate a stage of pathological rest in an acute virulent disease where progress can only be revealed by opening the abdomen.

Any surgeon who is not a first-hour operator during any stage of peritonitis becomes an obstructionist to early diagnosis. He has taught the general practitioner that there is some other hour than the first which is safe to operate; and has thus taken from us our strongest support, early diagnosis, and given in its stead a promise of operation if the patient gets well.

If one is called in consultation during an acute attack of peritonitis, and you refuse to operate during the acute symptoms, it would be interesting to know to just whom that patient belongs. The family physician has asked your assistance. You refuse to operate during the acute inflammation, but take a mortgage on the patient by promise to operate, if that hoped for stage of quiescence intervenes before death.

It would seem that the patient is without a physician from the time of consultation until death or stage of quiescence.

The surgeon is certainly responsible from the time he sees the patient during an attack of peritonitis, and if death occurs while he is waiting an opportunity to operate, such death must be figured as part of his mortality in his statistics. If such is not done, it simply means that the operator is picking his cases.

The fact that in some institutions patients with an active peritonitis are kept for certain operative hours or certain clinical days, is reprehensible. Dr. Price does not too strongly put it when he says, "The fire department teaches us our duty in peritonitis."

Helpful responsibility must be placed upon some one member of the profession. Divided responsibilities breed neglect. Dr. Price holds no one responsible for an error in the operating room. He is answerable for visitors, nurses, and assistant, and is the autocrat of the operating room.

The layman or physician who engages your professional services does not ask you who your assistant or nurses are, but takes it for granted that you are responsible for attendants.

That sublime degree of vigilance and protection can not be obtained by other than individual responsibility.

You must carry your own burden to be conscious of its weight.

Even the greatest degree of refinement of masterful technique will punish you by sleepless nights. Sacred responsibility and persistent efforts in certain directions encourage many inconsistencies in surgical procedures. This is but the natural history of great minds overdeveloped along certain lines.

It is said that Blackstone, the great lega commentator, believed in witchcraft, and cited the scriptures for his belief.

Voltaire says that when Newton discovered the law of gravitation, he excited the envy of the scientific world, but when he wrote a book on bible prophecies, men of science got even with him.

The popular view in peritonitis of the surgical profession at this era is "anti-absorption."

As we feel there has been a marked degree of surgical inconsistencies along these lines, we usually have to modify the term "anti-absorption" and call it "anti-extra intestinal absorption," as the followers of this method of treating peritonitis are wholly unmindful of the absorption which takes place from a pathological mucous membrane of over twenty feet in length.

I am at a loss to know just why it is that the physiological surgeon has lost sight of the importance of drainage of the mucous membrane of the gastrointestinal tract in the virulent forms of peritonitis with obstruction or partial intestinal obstruction.

From the very incipiency of an inflammatory lesion, beginning with the cloudy swelling of the mucous membrane and extending through all stages of the inflammation to destruction of that particular viscus, until the serous surface is involved, the clinical symptoms must be largely those from absorption of toxins or bacteria from the mucous surface. So why should we so ignore this vast absorbing surface in the distended and obstructed bowel? Intra-intestinal drainage by puncture of bowel and releasing obstructions is indicated just as strongly as opening the abdominal cavity to drain the parietal or visceral peritoneum.

In laity terms, indigestion, bilious headache, sluggish liver, and all the mild autointoxications from the gastrointestinal tract are an appeal for drainage, and the clinician does it with a cathartic. We have often wondered

just why the internist has not called the attention of the world to a more extensive drainage of the obstructed bowel in a general peritonitis.

Peritonitis, other than the traumatic forms, is primarily a lesion of the mucous membrane, be it due to appendicitis, salpingitis, cholecystitis or typhoid perforation, and can and should be diagnosed as such in a large per cent of cases.

Therefore inflammations of serous membranes are largely neglected lesions of the mucous membrane and are again a plea for early diagnosis.

How often have we seen this exemplified in the removal of simple catarrhal appendix. The patient may have been an invalid for years, below weight, bad color, chronic indigestion, etc., and all symptoms due to toxins absorbed from small area of mucous membrane which has undergone a mild form of inflammation.

The removal of such an appendix will often amaze one by giving you a robust patient.

The physiological mucous-membrane is a staunch friend, but can not nor does not stand the offenses of obstruction and stagnant pathological fluids, which quickly convert it into an enormous area for absorption of toxins and bacteria.

The anti-extra intestinal absorption method (which we choose to call it) has as surgical factors of accomplishment a small incision for a lease of intraabdominal pressure, and insertion of tube to pelvis, or dependent points of the abdomen, the offending source may or may not be removed, depending upon as to whether or not it can be reached without disturbing adhesions which are not molested. The patient is put in the Fowler position and proctoclysis given.

It is a strange coincidence but a surgical fact, that operators working along entirely different lines approach the same goal by routes which seemingly are diametrically opposed.

Probably no operator has been as consistently radical in his toilets in peritonitis as Dr. Joseph Price.

In spite of the fact that the profession seem to be under the impression that he is not afraid of absorption of toxins and bacteria, on account of his fearless breaking of adhesions and releasing pus pockets and obstructions, he must be looked upon as the most consistent advocate of anti-absorption, both intra- and extraintestinal.

Early in his professional career he pointed out the dangers of obstructions or partial intestinal obstruction, following or incident to peritonitis, and his dealings have ever been directed toward the complications of this disease. It is not so much the peritonitis but fear of its complications.

If we would direct our surgery at the real existing condition, we would be oftener operating for intestinal obstruction and not simply talking about distended abdomen, which is not a symptom but a condition.

No symptom or sign ever killed a patient, but conditions do. If the members of the profession have at any time adopted Dr. Price's radical toilet in active or chronic peritonitis and failed, it must be due to an omission of detail and thoroughness in their technique.

The beginning of a radical toilet commands its completion. The obstructionist, as to completed procedures, such as the breaking of all adhesions, releasing pus pockets and obstructions, and flushing the abdomen, make this argument. It matters not how thoroughly you attempt to cleanse the abdomen in a general peritonitis, it still remains surgically unclean.

Quotation of results is the most forcible way we can answer this argument; and it would seem that they might allow us a little courtesy from the phagocytes when they expect so much from this source.

It is not at all clear to us just what the mental picture in peritonitis is to the operator who opposes the radical toilets.

We look upon the abdominal cavity in a general suppurative peritonitis, as a huge carbuncle with its honeycombed pus pockets, and although we can not make the crucial incision and curette here the intercellular spaces as we should in the carbuncle, we practically do the same thing in peritonitis by breaking adhesions and releasing pus pockets and obstructions.

We have not that mechanical view in general peritonitis which seems to be popular among

a large number of the surgical profession; therefore Dr. Price does not depend upon gravity to drain filth from distant points.

Evidently we have not the picture of free infiltration of inflammatory debris between and among coils of intestine, mesentery, and omentum which have become agglutinated enclosing pus pockets. Anatomically, some beautiful work has been done demonstrating the dependent points of the abdomen when in different positions, but it is a grave error to apply such mechanical ideas to the abdomen in a state of general peritonitis.

I have seen a number of operators inserting numerous drains to supposed dependent points of the abdomen, completely ignoring pus pockets above and between such drains.

We do not have pus pockets scattered through the abdomen as mere coincidences. There is a pathological and anatomical reason for such distribution of filth. The dependent points of the abdomen in peritonitis must not be looked upon as cesspools and the remainder of abdomen ignored on account of its altitude.

You are expecting too much of physical laws; gravitation of filth through inflammatory barriers is too much to ask of natural laws of gravitation. If gravity is such a ruling factor as to the distribution of filth, why do we not always have filth in the pelvis in suppurative appendicitis?

Operators with extensive experience know when the appendix is over the iliopectineal line, the pelvis will be full of filth; or when the appendix is behind the cæcum or between cæcum and parietes, respectively, you will find the inflammatory products.

Extension of filth by the accumulation of its products may be found in most any region of the abdomen, and metastatic conditions frequently take place from neglect and are always an appeal for earlier intervention.

Drainage, or any accessories to abdominal surgery, must not be based on probabilities, but on demonstrated conditions.

The material from which this paper is written is based on five hundred cases of diffuse and general peritonitis.

I have not included any cases where the peritonitis was not of sufficient extent to necessitate toilet and open treatment.

The term "diffuse peritonitis" is largely an arbitrary one. I would make this definition of it. If the appendix, cæcum, and over eighteen inches to three feet of ilium were involved, I would call such a diffuse peritonitis, and would include all degrees of extension, short of a general peritonitis, under the same term.

In one's statistics, reporting diffuse and general peritonitis, they must be demonstrated as such.

We are at a loss to know how operators can report cases of general peritonitis, when they are men who do not break up adhesions and expose viscera. It must be apparent that such reports take too much for granted.

An operator who does not make a general toilet in peritonitis, has no substantial surgical ground for reporting a general involvement of the peritoneum from any local tap. Such report, if given upon symptoms, such as general tenderness or distention, is without substantial foundation, as we have seen many patients with general tenderness and distention from a very minor involvement of the peritoneum.

The appendix over the iliopectineal line will give general tenderness and diffuse symptoms; again the distended abdomen may be due to an inflammatory lesion at the head of the cæcum involving a few inches of the ilium, or possibly an inflammatory band, elbowing the small bowel, which is very often seen within eighteen inches of the cæcum.

So before we can compare the relative merits of procedures in diffuse and general peritonitis, it must be definitely stated what has been the operator's method of demonstrating the extent of pathology.

Perforations of viscera are not always followed by general peritonitis and must not be reported as such.

Drainage is the salvation of the tardy diagnostician, and nearly always demands an apology.

In this series of cases we have not resorted to tube drainage in a single case. Gauze has been used entirely in the form of the properly placed cofferdam, without a stitch in the abdomen. In extensive inflammatory conditions with great quantities of filth, tube drainage is not sufficient.

Literature is full of discussions questioning the integrity and physics of gauze as a drain in peritonitis.

The philosophy of experience and common sense will answer all those who offend the greatest means of drainage we know anything about.

In regard to the physics of gauze drain, its fertility may be demonstrated in many ways. Suppose you insert a scientificially placed cofferdam in a filthy diffuse peritonitis; within three or four hours, the superficial gauze and cotton will be saturated. You change the same and in another few hours the same saturation takes place. This will continue with diminishing discharge for three or four days.

For the sake of argument for those who contend that the saturation of the superficial dressings is a physiological outpouring of serum incident to the insertion of the gauze as a foreign body, suppose you remove the gauze drain too soon, you will find a puddle of filth at the side of the cofferdam which would not have occurred if the dam had been allowed to remain the proper length of time.

If the gauze is not a drain, how do you account for the puddle of filth, which does not and should not occur if drain is properly placed and allowed to remain for a sufficient time?

The efficiency of the drain has been questioned through neglects of toilets. Operators have failed to find the ultimate pus pockets which may have later ruptured and deluged the drain, and thus the oversaturated drain seems not to be performing its function. What we want in drainage is continuity between the drain and the filth areas.

We should not expect to drain the Great Lakes by inserting a drain in Salt Lake. The fact that gauze drainage is not understood, is not properly placed, and has been expected to do the surgeon's handy work, has led to counter and multiple punctures of the abdomen.

The care of drainage has done much to modify the operator's technique. After Dr. Price's complete toilets, when the drainage is removed, there remains a dry well.

The operator who does not make a finished toilet, often finds a great quantity of filth at the site of the drain.

So he reasons that a counter puncture should be his next step in progress. His progress is in the wrong direction.

Multiple punctures of the abdomen in peritonitis simply means inaccuracy in diagnosis, a non-comprehensive idea of drainage.

One of the greatest pleas we know for drainage is the fact that those forms of peritonitis which are least accessible to drainage have a high mortality.

In the retro- or subperitoneal varieties of infection the mortality is high, not altogether due to the fact that the cellular tissue here is particularly adapted to rapid absorption of toxins; but that we are not able to drain this retroperitoneal space. These patients do not apparently die from peritonitis but a true septicæmia, if it is possible to make such a pathological distinction.

After operations on this type of infection your hopes will often be built on misleading symptoms, as these patients often die with a flat abdomen and soluble bowel; both symptoms which we would welcome after general peritonitis.

Unfortunately in this type of infection, we see the patient later than in the more superficial forms of peritonitis.

The appendix, when in the retrocæcal region, is not recognized as early as abscess between the cæcum and parietes; and is the most difficult form of appendicitis to drain and make a thorough toilet.

Pain in such a condition comes distressingly late, and is not a conspicuous symptom until the parietal peritoneum is involved. These retrocæcal conditions are responsible for a large per cent of the retroperitoneal infections and are similar in their symptomatology to the post-partum infections. In this type of infection we find the pulse rate and temperature in excess, when compared to the slight pain and tenderness incident to such condition.

When the appendix is in the pelvis or projecting over the iliopectineal line, I believe pain is an earlier symptom than the retrocæcal variety; but the location of a definite point of pain is misleading, and the rigidity of the right rectus muscle is not so well marked. The left side is often as rigid. The pain is a diffuse one. Tenderness in most any part of

the abdomen can be elicited; this variety also comes to the operating table late, due to the indefinite location of some point of trouble. The patient will give a very indefinite history of fleeting or unstable pains. The vaginal or rectal examination will reveal much in the pelvic variety of appendicitis; in fact no examination in peritonitis is complete without a rectal or bimanual examination.

When the appendix is between the cæcum and the abdominal wall we have early the typical symptoms of peritonitis; the early pains, tenderness, rigidity of the right iliac region, with slight elevation of temperature and probably vomiting, cannot very well be mistaken for any other condition.

Fortunately for the operators who do not break adhesions and make a toilet of the peritoneal cavity, this position of the appendix is most frequent and has the least mortality, for several reasons.

In the first place, on account of the typical symptoms, it is early recognized and surgical assistance obtained. It is the most superficial form, pus usually welling up as soon as the peritoneum is incised.

The abscess cavity in this location is more well defined and, therefore, easily drained. However, even in this type of appendicitis you have not done your duty until you have explored the pelvis and region between the ascending colon and parietes, as the filth may have extended from accumulation of quantity in both directions. It is probably with this variety of appendicitis that the early operators had their victories as it is possible to conceive that an incision such as the mere lancing of a boil, would save a certain per cent.

We cannot help but feel, in these days of advanced surgery, that it might be unfortunate for an operator to have had considerable experience with these cases and not be familiar with the diagnosis, pathology, and surgery of the rectocæcal and pelvic varieties of the disease.

Surgery applied to this superficial condition is wholly inadequate to reach the other deeper varieties.

If operators will review their experience, they will probably find that their mortality did not come from the condition where great quantities of pus flowed from the incision, but from that condition in which the appendix was reached with great difficulty or probably not reached at all.

With a degree of propriety the profession at the present hour can be divided into two classes. First, the physiological surgeon, who directs his surgery towards assistance of the natural physiological resources; and secondly, the pathological surgeon, who boldly attacks peritonitis through and by what we call a completed toilet of the peritonitis and its complications; viz., obstructions, etc.

We are fully conscious of the great debt of gratitude which we owe Metchinkoff and Wright for their exhaustive work with the phagocytes and opsonins, but it does not seem they have asked us to make our surgery less radical because they have given us some rational knowledge of the physiology of our natural powers of resistance to invasion of infection.

I am unable to see where they have dictated to us as to where, when, or how we shall do our work. They have illuminated our physiology but have not intruded upon our pathological surgery. Dividing the surgical profession into two classes, physiological and pathological, Dr. Price with his completed toilet must be looked upon as the greatest advocate of pathological surgery.

The literature of the present hour is so forcible in its condemnation of the Price toilet, and even so bitter in its denunciation, to the extent that some authors go so far as to say that it is criminal to break adhesions in the presence of pus.

Why can one operator win with a technique where the other fails? What are some of his working factors? To say nothing about a personal endowment, courage, skill, and judgment, we find this operator working with the most simple technique possible.

The patient is always in the horizontal position. The Trendelenburg position is never used. Therefore the lungs are not overflooded with venous blood.

Post-operative pneumonias are never heard of. Whether this complication does not occur because the patient is in the best position to take the anæsthetic (which is always ether)

or whether it is due to the completed toilet, which prevent the subdiaphragmatic, metastatic or hepatic abscesses, we are unable to say. I feel both are important factors.

Rubber gloves are not used. The hand is always at its best manipulative power. The sensitive and intelligent hand has its greatest demand in dealing with the adhesions of a peritonitis.

Heaving and pulling at a bowel in order to break a fixed point is one of the most rude steps in an attempted toilet. Slight traction on the intestine, in order to define the fixed point, is all that is necessary. The adhesions must be released by expression or pressure with thumb and finger at the expense of the adhesion, and not by traumatic traction on the bowel. Such manipulation cannot be intelligently done with the gloved hand.

I shall not discuss the hæmorrhage mortality from the glove, but it has one, from insecure ties. Each little refinement of technique which you may attempt with the gloved hand falls a degree short of that surgical consummation of detail which wins the fight.

Slight abrasions and all lacerations of viscera should be carefully and quickly repaired with fine silk and small straight cambric needle.

This work cannot be done as quickly and thoroughly with the gloved hand. If the glove has given us anything in cleanliness, it has had its drawback through loss of time and imperfection of work in all the finer points.

I could not afford to say this, if I had not seen hundreds of patients operated upon by gloveless hands and not even a stitch blush follow.

I feel in peritonitis where the glove is quickly soiled, and not as easily cleansed as the bare hand, it has been a positive harm. Peritonitis and its complications are the most important lesions which confront the surgical profession, and we cannot afford to be handicapped by any means which obtund our special senses or interfere with our working factors.

I have seen a number of operators attempting to do what they called the Price toilet in a peritonitis. I could not have recognized it as such even if it had been so labeled.

To attempt to describe his technique would be a miserable failure.

In 1879 he began his fearless work upon a patient who was dying from a general peritonitis following a criminal abortion, which is one of the earliest procedures of a completed toilet. This patient was eviscerated, flushed and drained by his cofferdam, which antedates the Mikulicz drain, and the patient made a good recovery. His toilets ever since have been consistently radical, and only with the view that the ultimate point of infection must be reached, can you win.

It would seem from the literature of the day, that the presence of pus when operating for appendicitis is a command to stop all manipulative procedure. It is decidedly a command to go on and reach the source of trouble. The presence of pus should be looked upon as merely the trail of the offender, and not as a pathological entity. You may have pus in the pelvis or in region of the appendix from a perforated gall-bladder. So we reason that its presence invites investigation which should not end short of the infecting source. I should be unhappy indeed in my work if the presence of pus was as forbidding to my progress in toilets as it seems to be to many.

The unfortunate part of timid surgery is that it will breed more timid surgery. The profession is being taught that the acute spreading lesions with high temperature, are not operative cases, and that a stage of quiescence must be waited for.

Our only hope is that the practitioners who have had the experience of seeing their patients operated upon at the first hour in any stage of a peritonitis, and by an operator who seeks the distal source of infection, will demand advanced and early surgery.

I feel that the divided views of the profession in regard to early work is both reprehensible and sad. To feel that we have at our fingers' tips a means which can blot out any probable mortality from appendicitis, yet thousands of the youth of our country die yearly.

I hold it true, that any death from appendicitis in an educational center, is a human error, be it the unwillingness of the patient, the tardy practitioner, or erring surgeon. It would be fortunate if the profession felt that every case of appendicitis was fatal without operation. We would then be operating for

the lesion *per se* with nil-mortality, and not peritonitis.

Possibly if we ceased to use the word peritonitis and used in its stead the term neglected lesions of the peritoneum, it might serve to stimulate the tardy diagnostician and operator. I have been so often asked to describe the completed toilet of Dr. Price in the presence of diffuse or general peritonitis, following appendicitis, some of the general points may be related.

If you have reason to feel the condition is not a general one, and the abdomen is not much distended, the incision may be on the right side. The semilunar is a good working point and not necessary to sever any muscular tissue, although the incision through the right rectus muscle is an excellent one; yet here you will have more resistance from the abdominal walls and, therefore, not so good for drainage. In clean cases, the right rectus muscle is an excellent point of entrance.

If pus or lymph appears in the incision, take it for granted the abdominal cavity is filthy throughout, and only permit investigation to determine the extent of the peritonitis. That is, you take nothing for granted and find the ultimate infecting source. Remember that the gangrenous or perforated appendix is a perforated bowel, and should be just as diligently sought for as such lesion.

When pus or lymph appears, let your mental picture of the condition be that of a perforated viscus. Take this strong position and you will not be expecting providential results from a perforated appendix, pouring its venom into the peritoneal cavity.

There is little use to attempt to clean the sewer until you have stopped its source of filth. To simply open the abdominal cavity and drain without thought of toilet and repair of the perforated lesion, is a procedure without surgical grace. In making a toilet in the presence of peritonitis by visceration and cleansing of viscera, do not dive or delve through pus laden area to seek the appendix, but deal with the viscera which is first accessible and make your toilet by dealing through continuity of structure of viscera, until you have defined the offending point.

In the presence of filth, work from the inside out and not from the outside in. If you have opened into a pus cavity do not make any attempt to wall off the supposed uninvolved viscera, by attempting to pass gauze over or through a filthy area with the idea of protecting the general peritoneal cavity. The fallacy of this is self-evident. However, if the incision has been made toward the median side of an abscess from the perforated appendix, and you have exposed uninvolved viscera, it is well to protect the general peritoneal cavity by inserting a gauze towel, before you attempt to break adhesions in order to get the appendix.

Get rid of the toxic matter as you come to it. Do not work in the midst of filth. The evisceration may be done beneath a stream of hot saline solution, sponging off the viscera with gauze, which is an excellent method to remove the big pieces of inflammatory lymph which cling to the intestine.

Dr. Price often says "expose both sides of the mesentery," which simply means that all adhesions must be broken before such is possible. In regard to the use of hot saline solutions in the toilet of a peritonitis, we have hesitated to make any statement as to just how high a temperature saline should be used. I am sure our solutions should be much warmer than they are. We have noticed in those patients where the irrigation had been of such a temperature that it was painful to the operator's hand, these patients left the table in better shape and were benefited by early bowel movements. The heat applied in such manner would be an excellent general stimulant, as well as one to peristalsis, both indicated in these abused patients. We are unable to say what additional antiseptic properties, if any, the hot solution has over the ordinary warm saline. Evisceration is never done by traction, but by inserting the finger between the adherent viscera, find a line of cleavage, and follow the point of least resistance.

In some cases you can enucleate clumps of adherent bowel and omentum and deliver the mass, as you would a tumor or a tube ovarian abscess, and then separate the viscera after you have delivered the mass. In other words, you deliver the viscera by lifting rather than by traction or pulling. I have seen an operator pull the intestine in two, or tear it from its

mesenteric attachment, and then wonder why his patient did not get well by the Price toilet.

The operator's ability to deal with adhesions will largely settle the question as to whether he will be a physiological or pathological surgeon. Disorganized or gangrenous omentum is removed, and all abrasions or lacerations of the bowel are repaired as you come to them. The presence of pus in a diffused peritonitis is not an indication that the entire abdominal cavity should be irrigated. The toilet is always proportionate to the extent of the peritonitis. The irrigator has its greatest virtue in those patients who have a general peritonitis with distention; even in those cases it is of little service as ordinarily used. You can not cleanse the abdominal cavity by simply passing the irrigator to a dependent point and then flooding the viscera with gallons of solution. It might be a conscience toilet but it certainly is not a surgical one. The irrigating solution would not come in contact with one twentieth of the area of the involved peritoneum. In cases of general peritonitis with distention, the incision should be in the median line, and the toilet a general one, and can only be done by evisceration.

Cleanse the bowel as delivered, exposing both sides of the mesentery and while the bowel is external, then irrigate the pelvis and both loins. Prevent the viscera from prolapsing into the pelvis as you irrigate. Two big fingers and the irrigator are a trivalve speculum which controls the viscera and permits the solution to come from the abdominal cavity with a gush, carrying debris with it.

Operators claim that this excess of manipulation greatly increases the distention of an already distended bowel, and that if they eviscerate they are not able to return the bowel. Certainly we should not attempt to return a distended bowel into the abdominal cavity, nor should we permit a patient to leave the operating room with a distended bowel. In a general peritonitis with distention we always puncture or incise the large and small bowel in as many places as is necessary to get rid of the gas and liquid fæces. This is truly the greatest drain, both intra- and extraintestinal. We get rid of the septic contents of an obstructed or partially obstructed bowel and lessen peritoneal absorption by release of intraabdominal tension, to say nothing about the drainage of the obstructed bowel, which is all important. I feel that the release of tension from the collapsed bowel incident to the puncture, is a far more material factor in the release of intraabdominal tension, than the small incision and drainage tube of the physiological surgeon. Even in strangulated hernia where there is much distention it is a very good rule to make an incision in the median line, so as to be able to deliver and puncture the distended bowel.

It is remarkable how quickly the bowel regains its physiological peristalsis when the tension from the distention has been relieved and you have irrigated with hot saline solution. I have seen such bowel regain its tone while the intestine was still eviscerated; and in a few hours after the operation, the patient would have copious bowel movements of liquid fæces. I am unable to see how the anti-absorption or physiological surgeons are going to reconcile the great and virulent absorption which takes place from the mucous membrane of an obstructed and distended bowel for which they forbid manipulation, on account of increasing peritoneal absorption.

It certainly is still a disputed question as to whether peritoneal absorption is increased or decreased in presence of a general peritonitis, and it is more than possible that the absorption from the mucous membrane of the obstructed or partially obstructed bowel is the final blow. A patient will die from a strangulated bowel with little or almost no evidence of peritontitis. The distended abdomen is a nightmare to the surgeon. It is true a patient with a retroperitoneal infection will die with flat abdomen and soluble bowel, but this cannot be truly called a peritonitis.

In the light of our present knowledge of peritonitis, we cannot afford to overlook the absorption which takes place from the mucous membrane of the obstructed or partially obstructed bowel. Whether the absorption of toxins is peritoneal or mucous, we are between two fires and it is hard to tell which is the hotter. I do know this, that Dr. Price has always laid great stress on relieving all obstructions and draining the distended bowel by puncture, and his results remain unexcelled. Therefore, in

general peritonitis our surgery is directed toward the complications of the general peritoneal involvement.

I am sure the profession has not understood Dr. Murphy in his magnificent work on peritonitis. The profession seems to be under the impression that Dr. Murphy does not seek the gangrenous appendix or perforated bowel, but depends upon the Fowler position, drainage, and proctoclysis to take care of the perforated lesion. I take the privilege of stating that this operator has no such mental picture, and consistently closes all perforative lesions of the viscera.

It is true that diminished peristaltic action of the intestine decreases peritoneal absorption. If we did not have to consider the intra-intestinal absorption, possibly our surgery might end with a hypodermic of morphia and withholding food, which is the most primitive step of all. If the fluid in the abdominal cavity incident to a peritonitis is early bactericidal, I am at a loss to know why the physiological surgeon puts his patient in the Fowler position to drain away this fluid. If you attempt to make any distinction of time as to when this bactericidal fluid becomes pathological you are trying to take a position which is not tenable from symptoms or signs. Experience has taught us that the early removal of such fluid by toilet of the abdominal cavity, even in the early stages of the condition, with temperature of 103 or 104 degrees, we are rewarded next morning by a temperature of 99 degrees and free drainage. If peritonitis we must have, give us the patient with a temperature of 103 or 104 degrees. We welcome it.

If there is a general involvment of the peritoneal membrane by some infecting means, how much physiological assistance must we expect from the natural powers of resistance from an early conquered endothelial membrane? What remaining power has the peritoneum in a general peritonitis? We cannot afford to permit the experiment with chemical irritants to too much modify our surgery in peritonitis.

The chemical irritant is an integral dose and has not the power of progressive production of toxins, and is applied to the normal peritoneum. Nor should we permit the injection of cultures of bacteria to greatly influence us. They also are applied to the healthy endothelial membrane or possibly to one which has been previously affected by an irritant. The fact remains that about all of the surgical lesions with which we deal are primarily mucous lesions; and before they are peritoneal in involvement have destroyed the viscus in continuity of structure, so that the powers of resistance of the peritoneum must largely be influenced as to whether the irritant is of the peritoneal or mucous membrane in its incipiency. For instance, appendicitis by extension of inflammation from the right tube and ovary through continuity or contiguity of structure, is not so virulent or dangerous as the condition we see in the appendix, where the primary infecting means has had its origin in the mucous membrane of the appendix itself.

Experiments have been made by injecting a known culture of bacteria into the healthy peritoneal cavity and a fatal peritonitis did not follow; yet, if the same dose is injected into the cavity where an obstructed bowel is present, fatality may follow. We feel this is a strong plea for complete relief of all obstructions, which can only be done by the toilet operator. Please compare the two following conditions of a general peritonitis.

Suppose in the first patient the viscera are bathed with pus and inflammatory lymph, yet there is no marked distention from adhesions or obstructions. From this patient remove the appendix and let your toilet be a peritoneal one in its extension, drain with a cofferdam, and the patient gets well. The next patient also has a general peritonitis, but has adhesions, obstructions, and distention of the abdomen.

If you make the same toilet in this condition as in the first instance and do not relieve obstructions and incise distended bowel, you will probably lose the patient. In the first instance, the toilet was peritoneal and was all that was indicated. In the second instance the toilet and drainage were both of the peritoneal and mucous membranes, as both were indicated. It would seem that it matters little whether the obstructed bowel is due to a mechanical ileus or to a paralytic condition which is due to a direct toxic effect upon the nerve filaments, or cellular infiltration of the

subperitoneal spaces; the indication for drainage of bowel remains the same.

I repeat that the gauze drain has been used exclusively in all our patients in the presence of diffuse or general peritonitis. This cofferdam drain is a solid cylinder drain, and is not composed of a number of flying buttresses or strands of gauze inserted indiscriminately between the viscera. To know anatomically that there exists a dependent point, and then to insert a drain on the hypothesis that it should be full of pus, is no part of our surgery. The insertion of a cofferdam of gauze is a perfect piece of civil engineering. If the pelvis is to be drained, all viscera are held above the iliopectineal line and the gauze, as a solid wall, fills the pelvis.

The right groin is drained in the same way. The viscera are retracted toward the median line and held back of the left hand, while the cofferdam is inserted; thus, in the very bad conditions, the dam or drain extends from the left side of the pelvis around to the ascending colon. If the bowel is black and disorganized, it is well to produce an artificial fistula and stitch the bowel to the drain or parietes.

One of the reasons gauze has been abandoned as a drain is that operators have indiscriminately inserted it between the viscera; post-operative obstruction following. As soon as the gauze was removed, the obstruction was relieved; the reasoning which would follow is apparent.

Successful surgery is made of such an infinite number of niceties that necessarily we all must cripple the other man's hobby. All operations in which adhesions are not broken, obstructions relieved, and the ultimate source of infection sought and found, are followed by from twenty-five to thirty per cent of reoperations for post-operative intestinal obstruction or are reopened for distal pus pockets. Pneumonia, septicæmia, septic emboli, metastatic infections and secondary abscesses, must be anticipated and do follow imperfect toilets.

The surgery which we are asked to see and do, following these incomplete procedures, is appalling.

I have seen in consultation this week three patients on whom sections had been done for appendicitis, all over six months from the primary operation, and each with a fistula which would permit my big finger, and each still the unhappy possessor of his or her appendix. A fistula with an obstructed or partially obstructed bowel distal to it will not close, and there is no use to expect miracles in these days of plain hard work. I have not time to go into a discussion of the distressing morbidity which follows the operator who has not done good primary work. It will wreck many homes financially and morally. We have not had in the series of cases which comprise this paper, a post-operative obstruction nor a pneumonia. Permanent fistula following appendicitis when obstructions are released and appendix removed does not occur.

I did not intend to make any discussion in regard to the technique of removing the appendix, but three operations within the last five weeks following imperfect removal of the appendix, force me to add a word.

In the first patient, a child, the right tube and ovary were strongly adherent to the site of the removed appendix. There was no salpingitis, as it occurred in a virgin.

In the second patient, the head of the cæcum at the point of removed appendix was strongly adherent to the parietal peritoneum.

In the third case, the ileum ten or twelve inches from the ileocæcal junction was adherent to the site of the removed appendix, causing a partial obstruction. In each case the stump of the appendix could be demonstrated, and all had been primarily clean cases. To bury the stump of the appendix in a dead space undrained is unsurgical in every step, and, unnecessary procedure. All procedures which do not entirely remove the appendix are subject to criticism.

The remaining stump in a good number of cases must become an ulcer and therefore a point of irritation followed by adhesions. The operator who persistently leaves a part of the appendix will have no greater reward for his incomplete procedure than those operators who are attempting conservative work on infectious lesions of the uterine appendages. The literature of the present hour, discussing the treatment of the stump after removing the appendix, must be looked upon as antiquated surgery.

There have been some recent contributions on adhesions following the removal of the appendix. I would give the remaining stump as solution for such conditions. I described the technique of Dr. Price's complete extirpation of the appendix in the September number, 1905, of the journal of SURGERY, GYNECOLOGY AND OBSTETRICS. It is extremely unfortunate that the complete removal of the appendix has been condemned on account of a supposed predisposition to hæmorrhage.

I have a personal knowledge of over five thousand cases in which Dr. Price or I have performed the stumpless operation without an instance of hæmorrhage.

To admit that the operation is not safe is to admit that the operator cannot safely close a perforation or gunshot wound of the bowel, as this is all there is to the stumpless operation.

It is seemingly a paradoxical statement to make, but a review of the deaths we have had seems to indicate that our surgery was right and that in practically every instance the peritonitis had been resisted, death taking place from a true septicæmia or retroperitoneal infection. I make this statement as some proof that we can and do get rid of the toxic products of infection by complete toilets, and not as any apology for our mortality.

Our patients did not die with distended abdomens nor bowel obstructions following the operations, both indications of continued peritonitis. I am perfectly familiar with the fact that even in those cases where the patient succumbs from a continual peritonitis, in the last few hours there may not be as much distention as had been. We have frequently been informed that the patient is better as there is less distention and no pain. You will probably find this patient with a subnormal temperature, being in collapse and the end soon follows. In the five hundred cases of diffuse or general peritonitis, we had nine deaths. This includes the deaths in the hands of several assistants.

In one hundred and twenty-four of these cases the incision was in the median line for a general peritonitis with distention.

In the remaining cases with a diffuse peritonitis, the toilet was always proportionate to the extent of involvement of the peritoneum. In these diffuse cases we could have very easily reported most of them as a general peritonitis had we not been toilet operators, and thus defined the extent of the peritonitis. Three of our deaths were in patients seventy or older. One of the cases died one hour after the operation. This patient went on the table with a subnormal temperature of 96 degrees. I told the family the patient was in collapse, and only operated upon earnest solicitation of the father.

Another patient I lost was a vigorous man with cæcum and appendix on the left side. The appendix was gangrenous and retrocæcal. My error in this case was that I made the incision on the right side. It should have been in the center. My toilet of the left side would have been better and should have saved this patient, as it was, he died with symptoms of retroperitoneal infection.

All patients had the open treatment, not a stitch in the abdomen, and the cofferdam drain. The Fowler position was not used in any case. In fact the reverse position, or the foot of the bed was elevated in the worst conditions. This position was not used with the idea to increase or decrease absorption but to place the patient in the best position to resist shock of operations. You must give the nerve centers blood in these abused and neglected patients. We depended upon the complete toilet and not position for anti-absorption.

Proctoclysis was not consistently used but there can be no objection to its use. From the surgical neglect through incomplete methods which we have seen in the last year, we cannot help but become defensive, for even our own protection.

The multiple fistula, the intestinal obstructions, or partial intestinal obstructions, distal abscesses which are incident to a failure to reach the ultimate source of infection, partial or entire failure to remove the appendix, must become even more numerous through need of more toilet operators.

The future will give us impossible surgery. We repeat, that practically every death from appendicitis is a human error and that our surgery at the present hour is twenty years behind the progress of aseptic and complete work.

A POSITIVE PRESSURE CABINET FOR THORACIC SURGERY

By SAMUEL ROBINSON, M. D., Boston, Massachusetts
Surgeon to Out-patients, Massachusetts General Hospital; Visiting Surgeon to the Harvard Clinic

THE use of differential pressure in operations within the thorax has been the subject of much discussion. It should be a source of satisfaction, furthermore, that the disputes as to the comparative adaptability of the positive and negative pressure methods are becoming less frequent, for experimentation and practical experience have proven that both methods perform the desired function of preventing the possible ill effects of operative pneumothorax. The fact that there is a predominance of positive pressure apparatuses in the clinics of this country and Europe does not imply a superiority in method, but rather a prevailing preference for the simpler and less expensive apparatus. Not less than thirty-five clinics throughout Germany are supplied with some form of apparatus for differential pressure. From this fact alone, one might infer at least that surgery has come to recognize the usefulness, if not the necessity, of these contributions to the operative approach to the thorax.

It is not sufficiently recognized that F. Sauerbruch of Marburg is responsible for both forms of differential pressure. In one of his first publications he called attention to the possibility of reversing the patient in his negative pressure cabinet, at the same time converting the pressure within the cabinet to the positive form. The anæsthetist was thus enclosed with the patient's head within a chamber of compressed air. To Brauer and Peterson should be credited the development of the use of positive pressure as first suggested by Sauerbruch, and for the construction of apparatus. Brauer has furthermore contributed much to establish positive pressure as a reliable form of differential pressure for use in thoracic procedures, and many others have since published operations and experiments to further this conclusion. Engelken, in 1904, definitely recognizing Sauerbruch as the originator of the pressure theory, described a positive pressure cabinet with a special suction device for the removal of escaping ether or chloroform fumes. Willy Meyer has recently published an account of a double cabinet, which consists of a positive pressure cabinet resembling Engelken's, within a larger negative pressure cabinet, similar to the Sauerbruch chamber. With this combination of methods Dr. Meyer has the opportunity to employ either or a combination of the two. From animal experimentation and operation on the human with differential pressure, one might conclude that either method answers the requirements in thoracic surgery, with the one exception of total excision of the lung in the normal dog in which Sauerbruch and I have stated in a recent article the negative pressure can with greater safety and certainty insure the later obliteration of the emptied pleural cavity. But until it has been proven by an extensive series of operations on the human that the combination of methods can produce better results than either method alone, or that negative pressure is attended with greater success in the treatment of pathological conditions of the thorax than positive pressure, I am content to continue with the simpler use of positive pressure alone. There may be, however, certain abnormal conditions of the thoracic organs as a result of which the circulatory or respiratory conditions would be favored more by one pressure than the other, and much credit is due Dr. Meyer that he has made such future determinations possible.

I present this positive pressure cabinet described below, because certain of its features may be regarded as improvements. In so doing I do not offer it as a substitute for the smaller portable apparatus which I described in this journal a year ago, and which, in its modeled form, is pictured in this article (Figs. 7 and 8). For emergency and "out-of-town" operating such an apparatus is best suited, especially when manipulated by one accustomed to its usage. While in Germany I witnessed a transthoracic resection of the œsophagus by Prof. Sauerbruch. The patient was fifty miles in

the country. Dr. Tiegel of Dortmund transported his portable positive pressure apparatus thither, and maintained the inflation of the lung during the operation with perfect success. A mask was used and was briefly omitted on two occasions for the passage of an œsophageal bougie, without the onset of unfavorable symptoms, although two-thirds of the lung and much of the heart were exposed by a large retracted intercostal incision.

Of the efficacy of such portable apparatus I am convinced, but, given the opportunity to construct an apparatus best suited to the needs of the Massachusetts General Hospital with a large operating and anæsthetizing staff, I endeavored to construct a machine which should become one of the regular appointments of the operating room, not subject to injury, readily accessible, and easily operated by the least trained anæsthetizer. Economy of cost and space were to be considered, but portability was not essential. In choosing the cabinet form of apparatus I was further influenced by the desire to provide for the administration of any form of anæsthesia which might prove indicated in a given thoracic case. In a series of twenty-three such operations by me in the past year I have been much impressed by the anæsthesia administered by Dr. Freeman Allen, who has used ether, chloroform, anæsthol, and other mixtures with and without oxygen, interchangeably as the condition of the patient seemed to indicate. The patients have left the operating table without evidences of excess or ill applied anæsthesia, and of the four fatalities in this group, none could be credited to the narcosis. The cabinet method seemed to be the best opportunity for selective anæsthesia, and the problem of providing the portable apparatus with this possibility bid fair to render it too complicated to be manageable by those not especially trained in its use. Although, as I have stated in previous papers, the temporary removal of a mask, such as is used in the portable apparatus, is not attended with any considerable danger in most thoracic operations, it must be admitted that with a cabinet, the possibility of such accident can cause no anxiety, for the pressure may be retained at a lower level while the anæsthetist has complete control of the air passages.

This new apparatus consists of two parts (Fig. 2): a cabinet constructed of sheet metal, 5½ feet high, 3½ feet deep, and 4 feet wide; and a wooden box 2½ feet high, 2 feet deep, 2 feet wide, and 3 feet long. The cabinet is for the anæsthetist and the patient's head,— the box contains two ventilating pumps with one-sixth horse motor attached to each.

The front of the cabinet (see Fig. 1) presents a four-sided hood with a window in the sloping upper wall through which a light shines downward upon the patient's face. The purpose of this hood is to allow elbow room to the operator and assistant. It is riveted to a metal slide which can be raised and lowered by means of the wooden wheel adjusted at the bottom of the cabinet to a rack and pinion gear. As may be seen in Fig. 5, it is desirable to raise the hood if the patient is to be operated in the semisitting posture. The lateral adjustment of the hood to suit the posture of the neck and head may be accomplished by moving the cabinet to the right or left as the occasion may indicate. It may be said that this adaptation of the cabinet to the position of the patient has not been entirely satisfactory in other cabinets. The hole in the hood for the insertion of the patient's head is lined with a rubber collar which is elastic enough to permit the entrance of the head and yet firm enough to resist the pressure in the cabinet without ballooning. This collar is cemented to a metal frame which is riveted to the hood. The persisting seams are closed with asbestos cement. Attached to the same frame in similar fashion is an inside collar of thin rubber cloth with purse string (Fig. 4). This collar, when under positive pressure, is supported from tearing by the outside pure rubber cuff. The purse string need only be drawn loosely about the neck, for considerable leakage is permitted at this point without materially changing the pressure on account of the excessive volume of the two pumps.

Through a glass window, also, on the front of the cabinet one may read the water manometer which is supported before the window on the inside. The anæsthetist can therefore read the same manometer. On the right side of the hood are two small megaphones, one connected with the air tight ear caps worn by the

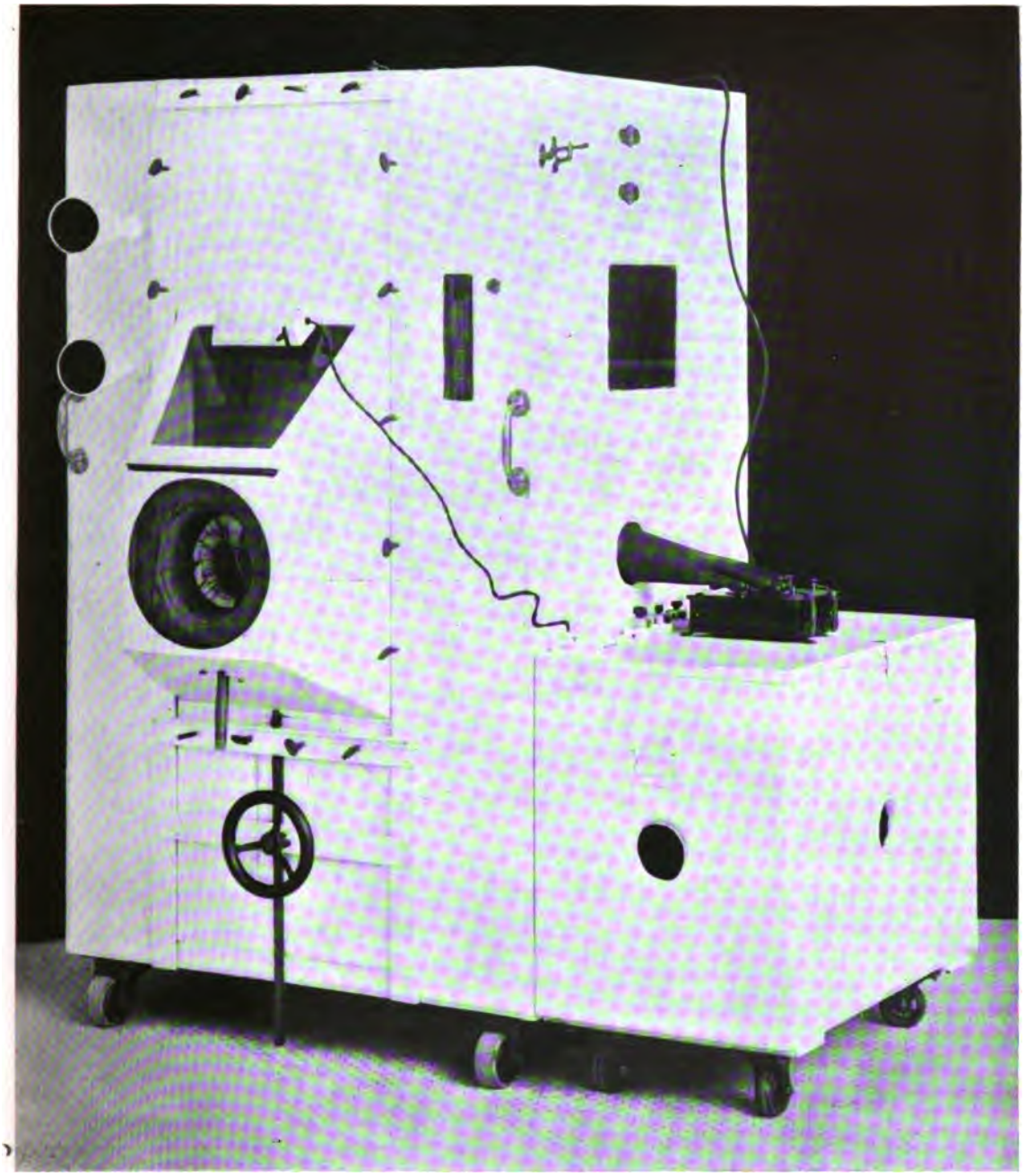

Fig. 1. Positive pressure cabinet and pump box. Front view, showing metallic hood with window and electric light, double rubber collar, and mechanism for raising and lowering hood, megaphones, manometer window.

anæsthetist (Fig. 3), the other with the speaking tube mask seen in the view of the interior of the chamber. The megaphones are at the level of the operator's face, and without turning towards the megaphone, his voice can be heard by the etherizer. The wall of the cabinet to the left of the anæsthetist, as seen in Fig. 2, includes a window. In front and in the upper corner is seen the outer door of a small air lock. The corresponding inner door of this chamber may be seen in Fig. 4. The included chamber is large enough to hold an ether bottle, œsophageal sounds, or any other paraphernalia which might be passed to the anæsthetist. As the inner door is not opened until the outer one is shut, the pressure reading of the manometer is not altered. In about the center of this left wall, at the level of the top of the pump box, there is a hole, around which is riveted and cemented a heavy large rubber glove. By inserting his hand in this glove, the etherizer may regulate the switches and rheostat on the top of the pump box. The object of this arrangement is to remove from within the cabinet all possible electric sparks which might ignite ether fumes. Furthermore, the control of the pumps is also possible to the operator or his assistant, although when once in action, these pumps may be allowed to run without alteration, and any change in pressure can better be made by the operator by means of the lever on the opposite wall of the cabinet which regulates the air escape. It is of some importance, however, that given an etherizer entirely unfamiliar with the mechanism, the operator can control or order the control from without. Fig. 2 pictures on this same left wall near the bottom two holes $1\frac{1}{2}$ inches in diameter. The efferent pipes of the two pressure ventilators which protrude from a corresponding position in the adjacent side of the pump box, enter these holes in the cabinet when the box is approximated to it. Two rubber washers and brass nuts applied from the inside of the cabinet make the union firm so that the cabinet and pump chamber move as one on the ball bearing casters attached to each.

Fig. 2. Left and back walls of cabinet. Pump box disconnected. Outer door of air lock open. Outer arms of refrigerator locks.

The opposite or right lateral wall presents a glass window at the level of the anæsthetizer's face. In the forward upper corner (Fig. 5) is shown a lever by which a valve 2 inches in diameter may be regulated. This is the main escape for air from the cabinet and the slightest variation in the size of the opening will, of course, cause an immediate change in the manometer reading. More than the necessary pressure may be obtained without at any time entirely closing this valve. There is, therefore, a tremendous air exchange constantly going on within the cabinet even while the pressure is maintained at the desired level. The exhaled carbon dioxide of the patient and the anæsthetist is constantly disposed of together with ether fumes. There has not been the slightest sensation of ether or chloroform effect to any anæsthetist who has operated within the cabinet. As stated above, the operator may vary the pressure in the cabinet

Fig. 3. Anæsthetist seated in cabinet with door open. Hand on regulation of escape valve. Ear piece in position. Rubber glove lying over cover to pump box. Note rheostat and switches.

as the conditions within the thorax may indicate, by moving the lever with a sterile towel. Or he may speak to the etherizer, who can regulate the same escape valve from within the cabinet. In Fig. 3 the etherizer's right hand is resting on the inside lever. I have found it most convenient to tell the anæsthetist at different stages of the operation how many centimeters of water pressure to produce on the manometer reading. He, being familiar with all the workings of the apparatus, has made these changes in pressure either with the escape valve alone or by a combination of the latter with an alteration in the speed of the pumps. Dr. Freeman Allen, who has anæsthetized the cases, has kept the pumps running at low speed with the escape valve wide open at times when no pressure was indicated. In this way he provided an ideal ventilation of the cabinet itself to his own advantage and that of the patient.

Fig. 2 shows the back of the apparatus. The door is also of sheet metal supported with a frame of square $\frac{3}{4}$-inch iron. The sill is lined with a strip of rubber ($\frac{1}{4}$-inch), against which the door frame is forced by the refrigerator locks which are shown in the photograph. These locks being double, the anæsthetizer can open or close the door from the inside at will.

There are four brass handles on the front and back of the cabinet by which it can be easily trundled into position.

The essentials of the inside of the chamber are shown in Fig. 4 and in Fig. 3. There is room enough for two to be seated. The stool now used is adapted to the height of the patient's face as regulated by the adjustment of the sliding hood on the front wall. The rest for the patient's head, represented in the photograph by a plain round plate, has been upholstered with sheepskin in the form of a doughnut shaped pad. This head rest can be moved forward, back, and laterally to render access to the patient's face with ether cone or chloroform mask. A shelf is provided at the etherizer's right for bottles, ether cans, etc. In the upper left corner is the inner door to the air lock referred to above. Above and to the left is the escape valve with its regulating lever.

I have avoided the use of the electric telephone for communication between the operator and anæsthetist, for two reasons. In the first place, it has not been entirely satisfactory in the negative pressure cabinets, partly because the vibrating diaphragm has been hampered in its movement by the unequal pressure on its two sides. Furthermore, with an electric telephone, complications arise which in seeking simplicity I have tried to avoid. The acoustic connections in this apparatus are on the speaking tube plan. As may be seen in the interior view (Fig. 4), one tube leads from the front right aspect to the cabinet up and across the ceiling to the center over the etherizer's head. A Y-connection with wired rubber tubes leads to two light metal ear caps to which are attached soft rubber collars such as are sometimes applied to the hard rubber telephone receivers. These ear pieces are held in posi-

Fig. 4. Front wall of cabinet from the interior. Inner door of air lock open. Shows speaking tube system. Water manometer. Head rest (not padded), inner thin rubber collar with purse string.

tion by the usual spring clasp over the head, and when the pressure is rendered plus, the soft rubber covers are squeezed tightly against the sides of the head, preventing the escape of air through the tube and also cutting out all noises but voice sounds coming from without the cabinet. When the ear pieces are not in position and the pressure is raised to a level of five to six cms. of water, one experiences a sensation of slight pressure on the ear drums, which increases in proportion to the rise in pressure. Although this sensation may be obviated by swallowing occasionally, the ear caps insure more normal feelings, the tympanic membranes being exposed to the atmospheric pressure. In order to leave the hearing apparatus undisturbed, the speaking tube is separately constructed with its own megaphone on the outside of the cabinet. After opening a valve in the tube near him, the anæsthetist may put his face in the mask and speak without permitting the leakage of air. A similar valve in the tube leading to the ear caps may be closed when latter are not applied, although when left open, the pressure in the cabinet will only fall 2 mms. of water from a level of 9 cms.

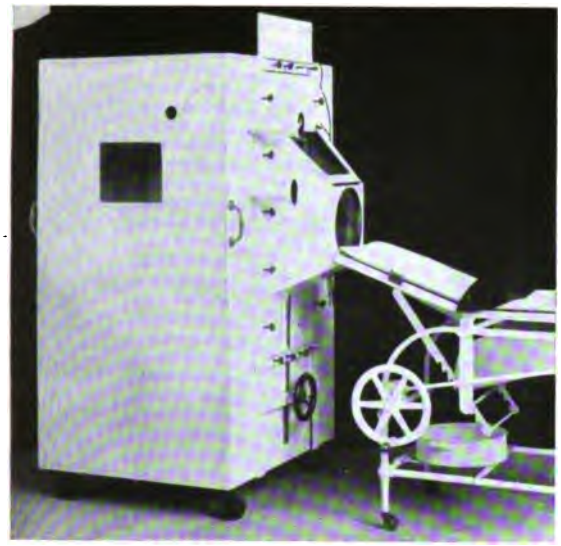

Fig. 5. To show partial elevation of adjustable hood. Opening of air exhaust on right wall, with valve lever.

Two large cylinders, one of oxygen and one of compressed air, may be placed in the back corners of the cabinet on either side of the etherizer. The oxygen he may use at will in connection with any form of any anæsthesia, leading it directly to the ether mask. If either of the ventilating pumps should suddenly fail to operate, the pressure in the cabinet may be maintained by opening the compressed air tank into the chamber, regulating its escape in the usual way and varying the pressure by controlling the exhaust valve in the right wall of the cabinet.

The contents of the pump-box are shown in the drawing (Fig. 6). Although the capacity of either pump run at full speed is sufficient to provide the required pressure, two were employed in case of accident to one, and furthermore, because with both running at moderate speed, the desired pressure is reached with less work to either motor, and with less noise due to the diminished number of rotations of the fans. The motors, switches, and rheostat are so wired that one or both pumps may be started, the rheostat controlling the speed in either case. The forward switch connects with the electric light on the window of the hood.

The problem of providing pumps to such forms of apparatus is not a simple one. If the pumps are to be run at some distance from the cabinet, perhaps in an adjoining room or in the basement below, high pressure pumps must be used to overcome the resistance of the tubing leading to the cabinet. Such high pressure pumps are friction pumps tending to overheat and necessitating constant oiling and care. They are heavy and expensive. Ventilators such as are shown here must be adjacent to the pressure area, for although of large volume, the pressure is not far in excess of that required for inflation of the lungs. They are built on the fan system, they are frictionless, and make little noise. They require low horse power motors and are less expensive than the high pressure pumps. I think there is no question that these are the preferable form of pumps for positive or negative pressure apparatuses.

One wire connection between the pump box and a neighboring lamp socket is all that is required in preparation for the use of the pumps. The cost of the complete apparatus was in the neighborhood of $300.00. Although greater in bulk, it is evident that the parts are simple and durable, and its mechanism uncomplicated. I have come to operate thoracic cases with the patient's head within the cabinet, whether the pressure is a probable necessity or not. The operation and anæsthesia are therefore carried on in the usual way, and at any indicated moment the pressure may be applied.

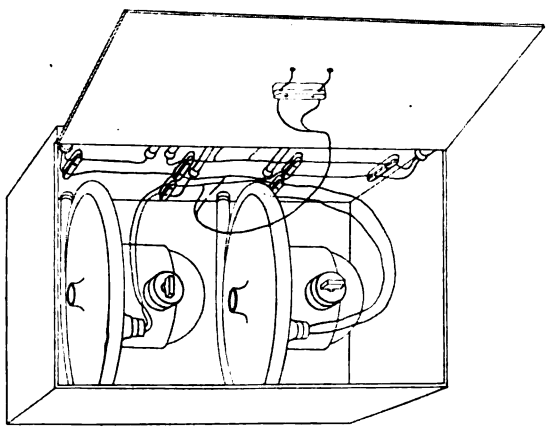

Fig. 6. Interior of pump box showing ventilators, motors and wiring.

Fig. 7. Portable and animal apparatus (remodeled), see text.

Even if the operation is started without the head in the cabinet, the latter may be applied in a moment's notice.

The portable apparatus shown in remodeled form in Figs. 7 and 8 differs from the apparatus described in this journal a year ago in several respects. The drop method ether chamber has been abandoned because its usage required constant attention by one person, and furthermore, because the stage of anæsthesia produced by the simple passage of the air through the ether bottle, was so unvarying and satisfactory that the drop method did not seem essential. In fact, the constantly renewed "fresh air" from a pressure blower such as is used in this apparatus, provides a combination with ether fumes not unlike the combination produced the commonly used drop method. There is never the least indication of overanæsthesia nor of a lack of oxygen. Another change is in the mechanism of raising and lowering the exhaust tube in the water column. This tube is now of metal and is moved by a rack and pinion gear. The cocks in the apparatus, which were originally rather inaccessible, have in the new apparatus been extended into the foreground and provided with wheel grips.

This small apparatus has continued to serve admirably as an automatic etherizing and positive pressure machine. In a large series of operations no assistant has been sacrificed to administer anæsthesia because of the simple control of the same by the operator without breaking asepsis.

In a paper read at Chicago before the Surgical Section of the American Medical Association in June, 1908, I referred to the administration of oxygen through the trachea to the bronchial bifurcation; also to a similar deep introduction of air to the same point. The idea of so using oxygen was suggested to me by Dr. Sollman of Cleveland and by the publications of Volhard. I was interested to substitute air to see if oxygenation of the blood could be maintained with the lungs in a state of collapse. I found in my experiments that deep intratracheal administration of oxygen would maintain the normal pulse rate and respiratory movements in spite of removal of the front of both chests and in the presence of almost complete collapse of the lungs. In substituting air under the same conditions, I found that it was necessary to keep the lungs

Fig. 8. Portable apparatus complete with pump and motor.

at almost full inflation. In other words, aside from the necessity of passing a tube to the bifurcation of the bronchi, which is a procedure of considerable difficulty in the human, though simpler in the dog, I could see no advantage in the method for practical purposes over the simpler use of a mask, as is shown in this small apparatus, or in the application of a peroral intubation tube such as I described in 1909. Meltzer and Auer have since utilized this intratracheal air method. That the lungs may be so inflated with sufficient air exchange as not to disturb the circulatory functions, I became convinced in my experiments in the physiological laboratory of Professor Cannon at the Harvard Medical School in the spring of 1908. Had I then believed that this method would ever substitute the mask or cabinet method, either in the human or in animals, I should have continued with it. But reminded by the throat specialist of the difficulty in introducing and maintaining instrumentation within the deep trachea, I look with grave doubts on the application of this method to the human. And knowing that the simplest mask method without irritation of the air passages is equally efficient in experimental thoracic surgery on animals, I am not convinced that there is any advantage in the so-called Meltzer-Auer method.

It would be the height of folly to allow discussion as to the priority of ideas to interfere with the perfection and application of any form of differential pressure which may aid us in our attack on the so-called inoperable lesions within the thorax. I have described two forms of apparatus as my feeble contribution to this cause, hoping that they will be superseded eventually by machines, methods, or devices of greater usefulness.

DIVERTICULITIS OF THE SIGMOID[1]

Report of a Case

By J. HENRY BARBAT, M. D., San Francisco, California

WHILE there has been considerable work done regarding the etiology of acquired diverticula of the intestines, there have been comparatively few positive cases of diverticulitis recorded. In a very complete article, W. H. M. Telling, of Leeds, gives short histories of 105 cases of diverticulitis, a large number of which, however, had been reported originally as some other condition. Brewer, in a recent article, gives a report of the first case of operation for diverticulitis before perforation, in which the diagnosis had been previously made. It was the second attack in the same patient, the first one having been operated upon after rupture. The reason for this apparently small number of reported cases of diverticulitis is undoubtedly due to the fact that the condition is not discovered either before or after death in a large number of instances.

Cases of left-sided abdominal abscess, followed by fæcal fistulæ, are unquestionably due to perforative diverticulitis. Several instances of vesicosigmoidal fistulæ have been reported due to ulceration of sigmoidal diverticula. Operators have been pleasantly surprised on many occasions to find patients recover after operation for apparent cancer of the sigmoid, in which the mass may or may not have been removed. These are also cases of diverticulitis. According to autopsy reports, acquired diverticula are found in varying proportions; the Johns Hopkins statistics giving one to every 72 autopsies, while the records of the City Hospital of Dresden give only one to every 1,162 autopsies. This apparent dis-

[1] Read before the San Francisco County Medical Society.

Microphotograph of diverticulum showing extreme thinning of wall, ready to perforate.

crepancy can only be accounted for by assuming that acquired diverticula were overlooked in many cases, and this would be easy to understand, because little pathologic interest was attached to these until recently, and unless especially looked for would not be noticed.

Martin Fisher, in a monograph on acquired diverticula, reviews the etiology, and concludes that they are due to several factors. First, the local weakening of the intestinal wall, especially at points of entrance and emergence of large blood-vessels. Intraintestinal pressure while undoubtedly a factor, can not be considered, in the light of experimental research, as a predisposing cause. A history of constipation is usually obtained in cases of diverticulitis. Age is an important factor, and Beer finds that old people are more liable to have muscular deficiency in the gut wall. Graser states that persons who have mesenteric venous stagnation are more subject to diverticula. Most cases of diverticula are in persons who are, or have been, obese.

They are found more frequently in the sigmoid and descending colon, but they have been found in all parts of the intestine, even the appendix.

The diagnosis of diverticulitis before rupture and peritonitis will undoubtedly become more common, as medical men keep before them the fact that diverticula of the intestines, and especially of the sigmoid, are not as rare as the older articles on the subject would indicate. Most diverticula of the large intestine contain fæcal concretions of varying hardness. With this knowledge, it is not difficult to figure out the pathologic possibilities. Telling gives the following summary of secondary pathological processes to which sigmoid diverticula are liable:

1. Infection of general peritoneal cavity from thinning of the sac wall without perforation. 2. Acute or gangrenous inflammation (diverticulitis). 3. Chronic proliferative inflammation with thickening of gut wall, and stenosis of the bowel. 4. Formation of adhesions to small intestines or bladder. 5. Perforation of diverticula, causing general peritonitis, local abscess, submucous fistula of gut wall, or fistula into other cavities, bladder, etc. 6. Lodgment of foreign bodies. 7. Chronic mesenteritis of sigmoid loop. 8. Local chronic peritonitis. 9. Metastatic suppuration. 10. Development of carcinoma. 11. Perforation into hernial sac.

The uncertain location of diverticula makes the diagnosis of infinitely greater difficulty than that of appendicitis. The majority of them being near the mesenteric border, and the patients obese, inflammation or perforation takes place inside of a mass of fat, and the symptoms are obscured until the peritoneum is reached; because the mere perforation of the gut does not cause pain *per se*, and it is only after the peritoneum is either inflamed or stretched that pain is elicited. If the diverticula are covered by peritoneum without the intervention of fat, an early diagnosis may be made and correct treatment instituted.

"Left-sided appendicitis" is a terse way of describing the usual symptoms of diverticulitis, but it must be borne in mind that the symptoms require even more careful analysis when on the left side than when on the right, because we are more uncertain as to the existence of diverticula in any given case than of an appendix. The sudden onset of pain, localized tenderness, and rigidity of the left rectus muscle should suggest the probability of diverticulitis, and as in appendicitis of this type an immediate operation. Secondary processes must be dealt with according to the pathology present.

Prognosis, of course, as in appendicitis, depends on the time which elapses between the onset of the disease and the arrival of the operator. The difficulties which we are going to encounter in treating diverticulitis are going to be the same which were met twenty years ago in treating appendicitis. The abdominal surgeon must convince the medical man that diverticulitis is much more common than is generally supposed, that its early recognition and correct treatment give a good prognosis, and that delay is often fatal.

I believe that every practitioner of experience can look back and see a number of cases which, if analyzed in the light of our present knowledge of intestinal diverticula, were undoubtedly due to diverticulitis and some of its numerous complications. Up to the present time the majority of cases have been seen only after perforation and abscess formation, and as in appendical abscess, opening and drainage are indicated, but we must bear in mind the greater probability of fœcal fistulæ following diverticular abscesses. If practical, the opening in the gut should be closed at the time of operation; and if the peritonitis is diffuse it is imperative that it should be done, otherwise it is impossible to carry out the proper post-operative treatment, as my case illustrates. When the patient is in fit condition and there is more than one diverticulum, which is usually the case, resection of the sigmoid should be done with end to end anastomosis, as in cases reported by W. J. Mayo.

Where stenosis of the bowel from inflammatory infiltration is present, resection is indicated. If the patient's condition will not warrant an extensive operation, colostomy, followed by subsequent resection, will give the best result. In both pre- and post-operative treatment, high enemas must not be used, on account of the danger of forcing the fluid through an opening in the gut. In cases of vesicosigmoidal fistula the viscera should be separated, the edges of the fistulous openings pared, and the openings closed with at least two layers of stitches. Drainage should always be provided after resection or the closure of fistulæ, but the drainage material must not be in contact with the line of suture.

While I have contributed nothing new to this subject, I trust that by calling your attention to the frequent existence of this extremely fatal disease, you will be more watchful for it in the future.

HISTORY OF CASE

J. T., aged 56 years. Family history good; no deaths from abdominal disease. In September, 1906, he had "chills and fever," which was found to be due to a cystitis. At Dr. Grosse's suggestion I did a suprapubic cystostomy, followed shortly afterwards by a resection of one inch of the urethra, which had a tortuous impassable stricture. He recovered fully after this and began to take on flesh. Three weeks before I saw him in his last illness, he noticed a pain in the abdomen more toward the left side, just below the umbilicus. The pain, which was at first of a boring character, became intermittent and colicky, and after two weeks he was obliged to remain in bed. He lost his appetite and the bowels, which had been previously regular, became constipated. At the end of the third week, he had complete obstipation, the abdomen was distended, he vomited everything introduced into the stomach, and presented a classical picture of a mechanical ileus. When I first saw him, he was tossing about in the bed, his face bore an anxious look and indicated intense suffering. On examination the abdomen was found very much distended, and tender over its entire area, with marked muscular rigidity. No mass could be made out, and percussion gave a tympanitic note over the whole abdomen. Examination with sigmoidoscope showed the lower bowel to be absolutely empty, and no sign of inflammatory spot could be seen.

Several high enemas had been given and brought away three or four small spherical masses of hardened fæcal matter, which were undoubtedly dislodged from some of the diverticula subsequently found in the sigmoid. The abdomen was opened the same day, and a quantity of seropurulent fluid ran out, but no intestinal loops protruded, on account of general adhesions, which were evidently causing the obstruction. The adhesions were rapidly loosened, but no atrium of inflection discovered, and not wishing to prolong the operation, a drainage tube was placed in the lower angle of the wound and the abdomen closed. The patient was placed in Fowler position, and Murphy's continuous proctoclysis given. In view of the pathology subsequently found, the proctoclysis was undoubtedly an error, and rather diminished than improved the patient's chances of recovery, as a large amount of the fluid found in the abdomen at autopsy was probably a part of the saline solution which entered through the perforated intestine.

On the third day after operation a small quantity of fæcal matter came through the drainage tube, in addition to the large amount of serum discharge which continued till the day before death. The vomiting and distention of the abdomen continued in spite of all treatment, and the patient died on the sixth day after the operation.

AUTOPSY REPORT

Partial necropsy twelve hours after death. Body of well nourished man. Abdomen very much distended and tympanitic. Abdominal wall, omentum, and mesenteries loaded with fat. The abdominal cavity contained a large quantity of seropurulent fluid. The intestines were injected, lusterless, and glued together with fibrinous exudate, which had caused obstruction of several loops of both ileum and jejunum. Appendix normal. The intestines contained besides a considerable quantity of gas, a large amount of yellowish green watery fluid. Separation of the intestinal loops disclosed a dirty gray sloughing mass of fat at a spot corresponding to the junction of the anterior layer of the mesosigmoid and the root of the mesentery. Pressure near the sloughing area caused fluid of the same type as was found in the intestine, to exude. The opening was traced down for 2 inches behind the anterior layer of the mesosigmoid, and a perforation of the sigmoid disclosed. The colon, sigmoid, and rectum were removed and sent to the pathologist. The other abdominal organs appeared healthy.

PATHOLOGIC REPORT

The specimen in this case is one of the sigmoid sixteen centimeters long; between the layers of its attached mesentery is a mass ten centimeters in diameter, consisting of greatly infiltrated fatty tissue, connective tissue, and enlarged glands, giving very much the clinical picture of carcinoma. On opening this mass, the central cavity was found to be directly continuous with the lumen of the intestine, by a small perforation located near the attachment of the mesentery. Within the cavity was a turbid serous fluid, a fæcal concretion corresponding in size to the perforation, as well as unshaped fæcal matter. On longitudinal section of the gut opposite its mesenteric attachment, twenty-six well formed diverticula were found, one of which was perforated; the perforation corresponding to the opening previously spoken of. The diverticula varied in size from that of a grain of wheat to that of a large pea, were arranged longitudinally, and located immediately within both attachments of the mesentery. The mouths of the diverticula were closed by labia of mucous membrane, making the entrance to each individual diverticulum smaller than its distended distal portion, and rendering their discovery extremely difficult, unless specially looked for.

The perforation and one of the diverticula were removed for microscopic examination, cotton was inserted into a number of the diverticula, and the specimen put through Kaiserling.

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DEPARTMENT OF TECHNIQUE

THE SURGICAL TREATMENT OF EXOPHTHALMIC GOITER

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ANYONE who has had an opportunity to observe the results which follow the surgical treatment of exophthalmic goiter must confess that it is the best treatment for this disease in nearly every case. The internist may prefer to adhere to the medical treatment, and in support of his belief numerous cases can be cited where the results have been most satisfactory. On the other hand, every practitioner has seen cases in which every form of treatment, except surgical, has proved ineffectual, and when finally surgical treatment was resorted to, a cure, or, at least, most marked improvement, followed.

It would be rash to say that every case of exophthalmic goiter is suitable for surgical treatment, because it is not. There are cases in which surgery has failed even to give the patient relief, but that may be said of any form of treatment, not only the surgical. Most authorities are agreed that in those cases where surgery has failed to produce results it was not the fault of the operation, but the fault of too late an operation being performed. Surgical treatment should not be considered a last resort, but should be looked on in the same manner as the medical treatment is regarded — as a form of treatment, and not as the last thing to be attempted, in the hope of giving the patient relief. An early operation, a careful operation, done by an experienced operator, and not by an occasional operator, are essential to success.

The best results from the surgical treatment of exophthalmic goiter are obtained by the men who are most competent to perform this operation, and this statement is borne out by a review of the results published by Kocher, who has, without question, performed the operation more often than any other surgeon. His results, however, are corroborated by other operators of note, such as Ferguson, the Mayos, and Halsted, whose mortality is not over five per cent. Most of the patients operated on by these men have made a complete recovery, a few have received only temporary or partial benefit, while a very small percentage have not been benefited, or they have had a recurrence of the disease. However, a comparison of these results with the results obtained from medical treatment will show a balance in favor of operation. The operative mortality is exceedingly small, and in most instances it must be ascribed either to inadvised operation, as in the very acute cases, or where the patient's condition was such that immediate operation was absolutely contraindicated.

It is well known that in some cases the disease develops with startling rapidity and severity. In the short period of three or four weeks the patient manifests to a marked degree all of the cardinal symptoms of the disease, and it is in cases such as these that early operation is contraindicated. If the symptoms in these cases do not yield to suitable preparatory treatment, such as rest and quiet, diet and hygiene, an operation sometimes is performed in the hope that the patient will be relieved. These patients recover promptly after the operation, although in a few instances the case ends fatally. It is extremely probable, however, that recovery would not have ensued without operation, and, therefore, the operation must be considered justifiable, and the result in no way militates against the desirability of operation.

Other cases in which operation is contraindicated are those in which there exists a cardiac lesion, cases of such long standing as to have produced a severe nervous disturbance, especially delirium, where there is present a degenerated heart muscle, irregular pulse or low blood pressure.

OPERATIVE RESULTS

A most valuable paper, to which brief reference may be made at this time, is that of A. Kocher.[1] Out of 3,460 operations done for goiter in his father's clinic up to that time, 315, or a little less than ten per cent, were done on 254 patients afflicted with exophthalmic goiter. There were only 9 deaths (3.5 per cent) in this series, only one of these occurring in the last 91 operations. All of the patients were benefited; 83 per cent were cured. Kocher emphasizes that patients with a low blood pressure should be watched and prepared carefully for operation, and should never be subjected to an immediate extensive operation. If

[1] Jour. A. M. A., October 12, 1907.

there is not an increase in the lymphocytes, the case is a serious one. In one early undeveloped case and in cases of long standing, Kocher found such an absence of lymphocytes. In not one of Kocher's cases was the patient not benefited in some way.

Krecke [1] operated on seventeen cases, and comments on the fact of how quickly the nervous symptoms subside after the operation. In 888 operations collected by him from five different clinics, the mortality was nine per cent. In one point his experience does not coincide with that of other operators. He has not seen the exophthalmos subside entirely in any case. Eleven patients operated on more than two years ago have been in excellent health ever since. In common with other surgeons, Krecke urges earlier resort to surgery and careful examination for a persisting thymus.

Klemm [2] had no operative mortality in thirty-two cases. After eight years twenty-five patients are still cured; one improved; one not improved; five untraceable. He operates in one sitting, excising the half of the thyroid which is most involved, and ligates the vessels on the opposite side.

Garré [3] operated on thirty-five patients, twenty of whom were traced five years afterward. The exophthalmos had disappeared in twelve, lessened in three, remaining unmodified in five. The tachycardia had disappeared in four cases. Nervous disturbances were still apparent in all the patients. Ten were in excellent health. Statistics compiled by him from various clinics showed 85 per cent of the patients cured or markedly improved. He calls attention to a very important point, namely, the search for a persistent thymus in all these cases. He found it present in 77 per cent out of 56 cases that came to the autopsy table.

Riedel [4] operated on 80 patients. Six died from bronchopneumonia out of the first 50 cases; one died from chloroform narcosis. Only one patient died from bronchopneumonia in the last thirty cases. The chief danger, he says, is from waiting. Early removal of the gland is urged, even though it may be only slightly enlarged.

In March, 1909, Kocher reported 320 cases, with eleven deaths (3.44 per cent). Since 1906 he has performed 153 operations, with only two deaths (1.5 per cent). This mortality is not much greater than that of ordinary goiter, among which during the last six hundred operations, he has had three deaths (0.5 per cent).

McCosh performed twenty-three operations with one death. Of nineteen patients traced, four were apparently cured at twelve, eight, seven, and four years respectively after operation. Twelve patients operated on during the past year are improved. Two patients, although benefited very much, still suffered from nervousness and tachycardia on exertion. Only one patient had not been benefited.

Dunhill performed thirty-two operations on twenty-five patients, with only one death. Only one of the patients was not improved by the operation, and it was noted in this case that while the wound was draining to the surface, the patient did well, the pulse being 80, but when the wound healed, the pulse increased in frequency and the associated symptoms returned.

Charles Mayo has had a mortality of five per cent in the last two hundred operations. Of 167 patients traced, 70 per cent were improved, cured, or greatly improved, and 94 per cent were cured, improved, or somewhat improved.

It is apparent, therefore, from the citations given, and the list could be continued indefinitely, that with improved technique the mortality has been greatly reduced.

PREPARATORY TREATMENT

The necessity for thorough preparatory treatment has been emphasized repeatedly, and the importance of this statement can be appreciated only by those who have had occasion to perform this operation often. This is especially true in the advanced and rapidly developing cases, in which tachycardia and mental excitement are marked, and are likely to be aggravated by preparations for operation. It is in cases such as these that Crile's method of "stealing away" the gland is useful. As a rule, the sufferer from exophthalmic goiter is in a nervous state, which is very undesirable, no matter what operation is to be performed. Therefore, the patient should be placed in bed and kept absolutely quiet for at least a week prior to the operation. During this time suitable medical treatment may be employed, so that when the patient enters the operating room it is without fear or dread of the consequences. It is in such cases that the best results are obtained. The patient is placed on a restricted diet, although by no means a starvation diet, and Clemens' solution, ten drops three times daily, is administered, which Ferguson has shown to be particularly useful in these cases. Some surgeons prefer to give belladonna or atropine, others have used Fowler's solution and strophanthus, and still others have given minute doses of morphine. None of these, however, seems to be quite as effective as Clemens' solution.

[1] Krecke: Muench. Med. Wchnschr., January 5, 1909.
[2] Klemm: Arch. f. Klin. Chir., vol. 86, No. 1.
[3] Presse Med., February 26, 1908.
[4] Deut. Med. Wchnschr., October 1, 1908.

In Dr. Ferguson's service at the Chicago Hospital excellent results have been obtained from the use of chloretone, given either for several days before the operation or only on the morning of the operation. The chloretone, when given in the former way, is administered in five-grain doses, every three or four hours, and when given just before operation as high as fifty grains are taken within a period of two and one-half hours — twenty-five grains two hours before operating, fifteen grains one hour before, and ten grains one-half hour before. The result of this medication is that the patient is partly drowsy, is perfectly quiet, and not resistant. Some patients are brought to the operating table soundly asleep, and are aroused only with difficulty. Not only does it remove restlessness, nervousness and fear, but considerably less of the anæsthetic is required, which is always a most desirable factor in any operation. The patient is anæsthetized quickly, less anæsthetic is required to keep him under, the operation can be performed more quickly, and the post-operative results are better.

THE OPERATION

The various operations employed seem to have been equally productive of good results. The method most in use is the collar incision of Kocher, exposing the gland freely, removing as much of it as in the opinion of the operator is indicated, after ligation of the thyroid vessels and closing the wound according to the method of choice, inserting a drain for a few days. Free drainage must always be provided for by means of silkworm gut, a capillary or a glass drain, placed in the angles of the wound, or in the center, as is the custom of Kocher.

In severe cases the operation may be performed in several sittings. Preliminary ligations of the superior thyroid arteries are made, in order to limit the vascularity of the gland and to reduce the amount of thyroid poison taken into the general circulation. In pronounced cases, with good hearts, a unilateral excision of the larger and more vascular half of the gland, including the isthmus, is made. In many cases, the ligation of two or three arteries and veins gives equally good results with removal of half of the gland. The removal of more than half of the gland should not be considered, except in rare cases.

The important principles in the operation are to avoid unnecessary handling of the gland, to check hæmorrhage promptly, no matter how slight, to be particularly careful not to remove the parathyroids, and to provide for suitable drainage.

Some surgeons have employed what might be termed a subcutaneous ligation of the vessels without exposure or removal of the gland, but this procedure must be limited to those cases that are particularly suitable for operation, that is, where the gland is not large or where only one lobe is involved, where the symptoms are very mild in severity, and where the patient is not suffering greatly from the thyroid toxæmia; in other words, where extensive surgical intervention is contraindicated or unnecessary.

In the typical case of exophthalmic goiter more extensive measures must be employed, and it is here that the procedure outlined above is indicated, and is productive of the best results. Ferguson employs the intracapsular ligation of the vessels, thus removing almost entirely all risk of injury to the parathyroids, because, as a rule, these glandules are situated outside of the thyroid capsule. When found within the capsule, it is usually in the posterior part of it, so that by avoiding injury of that portion of the capsule, one need not worry about the parathyroids.

TETANY

Formerly, before the physiologic importance of the parathyroids was fully appreciated, tetany followed in very many cases of thyroidectomy. Now, however, tetany occurs but rarely. In 700 cases operated on by the Mayos, not a single case of tetany occurred. Only those who have seen a case of tetany can be fully alive to what it means, and will strive always to avoid removing the parathyroids. However, the intracapsular ligation method of Ferguson and the habit of staying away as much as possible from the posterior capsule of the gland give reasonable assurance of not interfering with the parathyroids in any way. Of the many points to be borne in mind in performing a thyroidectomy, avoiding the parathyroids is by no means the least.

Where the disease was so advanced as to necessitate complete removal of the gland, Kocher has transplanted parathyroids with fairly good results, in one case the transplantation having been made into the tibia. Such extreme measures, however, are rarely indicated or necessary; usually only a portion of the gland need be removed. Ferguson removes all of the gland except a small button at each corner, which leaves sufficient thyroid tissue to obviate the occurrence of unpleasant symptoms afterwards. His results have shown the value of this procedure.

All hæmorrhage should be checked promptly; bleeding points, no matter how small, are ligated, and oozing may be checked either by pressure or by gently swabbing with Harrington's solution.

For ligature material catgut or very fine silk may be used, according to the choice of the operator.

Either a small or a large dressing may be applied. In favor of the large dressing stands out prominently the one fact that in all of these operations there is considerable oozing afterward, and by applying a sufficiently large dressing, the so-called mammoth dressing, the fluids are absorbed quickly, and it will not be necessary to disturb the patient for at least twenty-four hours afterwards, when the drain is removed, either wholly or in part, and a fresh dressing is applied.

AFTER TREATMENT

The after treatment is important. Of prime importance is supplying the patient with a sufficient amount of fluids, preferably water, and next is the enforcement of absolute quiet. It is remarkable how well these patients do. Relief is apparent in many cases within two or three days after the operation, and in every case the patient is able to be up and around within a week or ten days. The tremor has disappeared, there is no more headache or gastrointestinal disturbance of any kind, and even the exophthalmos, when present before the operation, is often unnoticeable. The general condition of the patient also improves rapidly, sometimes to a really astonishing extent. In two cases operated on by Dr. Ferguson the patient gained in weight one pound a day for forty days. The patients felt well, and when last heard from were still in the best of health, without any recurrence of the thyroid disease. Of 55 patients operated on by Dr. Ferguson at the Chicago Hospital within the last few years, four have died; the remainder are in excellent health. One case was of the most severe acute type. Symptoms of the most aggravated form developed suddenly, and operation was performed after six weeks of ineffectual medical treatment, in the hope of benefiting the patient, in some measure, at least. The second case was one of long standing. Two patients were moribund when operated on and operation was performed under protest — at the insistence of the patient's family and friends.

ANÆSTHESIA

With reference to the method of anæsthesia: Mention has already been made of the use of chloretone preliminary to the operation, for the purpose not only of quieting the patient, but to promote safer anæsthesia. Ether appears to be the anæsthetic of choice when general anæsthesia is desired. Many surgeons, however, prefer to operate under local anæsthesia, notably Kocher. Advantages are claimed for both methods. The general anæsthetic ensures absolute quiet on the part of the patient and eliminates a certain element of dread on the part of the operator that the patient may be suffering. For the local anæsthesia it may be claimed that the co-operation of the patient is secured, the shock is lessened, there are no post-operative symptoms, and otherwise the results are in every way the equal of those secured from general anæsthesia. So that the choice of method is largely what one has been in the habit of doing, and what has, therefore, yielded good results.

DIRECT IMPLANTATION OF BONE GRAFTS

By C. C. ALLISON, M. D., Omaha, Nebraska

The use of freshly prepared bone grafts for purposes cosmetic, or as an aid to the reconstruction of bone, seems to have promise of a more extensive application in the future than in the past, as the following clinical report will indicate:

L. N., aged 6, from lack of development of the body of the left inferior maxillary bone, presented a facial deformity so great that the parents sought relief from surgical measures and were willing to fully share the responsibilities of such an effort.

After paraffin injections had been discouraged by those experienced in its use, we consented to expose the toothless periosteal band, representing the body of the inferior maxilla, which proved to be a rather well developed membrane, over an immature alveolar process, and make an effort to implant beneath it a segment of bone taken from a chicken, which had been killed during the preliminary steps of the operation.

The thigh bone of the chicken was split and brought into the required shape by a file, then dropped into normal salt solution for one minute before implanting beneath the periosteum. The periosteum was closed over the bone graft with number one plain catgut, and the wound in the soft parts, which had been made below the margin of the undeveloped lower jaw, was closed without drainage. Besides the usual assistants, there were present at the operation, Dr. J. Ford Thompson, of Washington, D. C., Dr. Geo. Shiley, of Candle, Alaska, and Dr. E. D. Cummins, of Plattsmouth, Nebraska.

We were somewhat surprised and much gratified to find the wound heal without reaction, and the contour of the bone graft plainly evident.

The operation was done June 24, 1909. This operation seemed entirely successful at the end of three weeks, and if it were permanently so, it was apparent that another graft a little higher, and somewhat anterior, would greatly contribute cosmetically, toward lifting up the receding tissues below the angle of the mouth, and toward the mental symphysis.

The case was therefore directed to return after three months, to determine from the degree of success the possibility of a second attempt at further correction of the deformity.

Examination upon her return, September 20th, found the original bone graft to occupy the position in which it had been placed, its size undiminished, and the surrounding tissues healthy.

The old scar in the soft parts was again used in exposing the field for a second graft to be placed a little higher and more anterior than the first.

We were encouraged to find, upon exposing the first graft, that it was firmly fixed. The periosteum was stripped back with about the usual effort and a second graft was implanted.

Following this effort, there has been uncomplicated wound healing, the condition of the soft parts seem normal, and the deformity is practically overcome.

Our experience in this case would lead us to believe:

First, that fresh bone grafting will require periosteal support in order to secure the fullest measure of success.

Second, that the porous bone of the available chicken is probably the most suitable one for grafting.

COMBINED TRANSVESICAL AND EXTRAPERITONEAL METHOD FOR REMOVAL OF STONES FROM LOWER END OF THE URETER

By MAX BALLIN, M. D., Detroit, Michigan
Attending Surgeon, Harper Hospital

"Calculus at or near the vesical orifice of the ureter may be reached in a variety of ways. If the stone is within the bladder wall, bulging the mucous membrane, or projecting into the vesical cavity, it may be extracted by a transvesical route. Dilatation of the urethra in the female, suprapubic cystotomy (Morris prefers perineal section) in the male, permits the removal of the stone by divulsion or incision of the ureteral orifice, perhaps aided by the lithotrite or scoop. When the stone lies outside of the bladder, low down in the pelvis, it is singularly inaccessible. Sometimes it may be reached by an incision in the vault of the vagina — risking uretero-vaginal fistula. Such a stone has been reached by a transverse perineal incision. (Hurry Fenwick.) The rectal route presents obvious objections. Morris has successfully operated by the sacral route. But usually the line of attack has been intraperitoneal or inguinal. These last two routes are probably preferable."

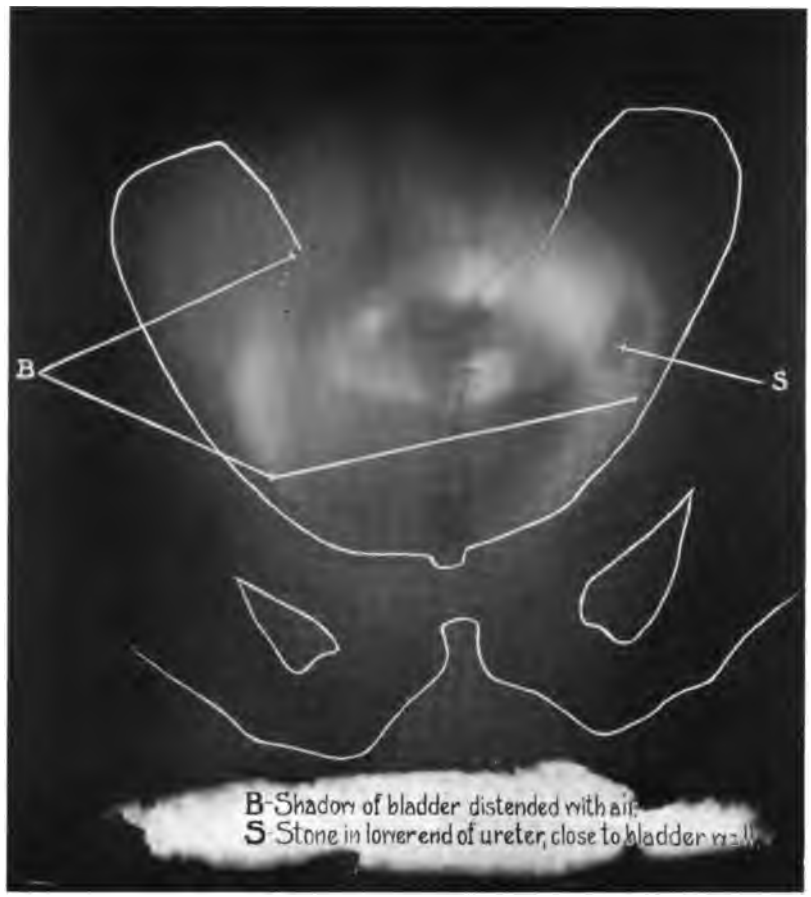
This statement from Keyes, in his text-book on genito-urinary diseases, explains the different methods in use for removal of stone from the lower end of the ureter.

With all these methods, every surgeon of some experience in this particular line of surgery, knows how impossible or at least how very difficult it is at times to remove a stone lodged in the lower end of the ureter. The author himself knows of two cases where the operation was simply discontinued after opening the bladder, on account of inability to dislodge the stone.

The following case was met with in our practice and we were confronted with the impossibility of removing the stone through a suprapubic incision. Therefore, we employed a combined method adding to the suprapubic incision in the bladder, an extraperitoneal one that rendered the removal of the stone surprisingly easy.

We will give briefly the history of this case, and at the same time the technique of the operation:

Mr. J. S., 27 years old, consulted me first on February 15, 1908. He gave the history of having had gonorrhœa one year ago. His present illness began two years ago, with attacks of pain in the right lower quadrant of the abdomen. In the first attack he was sick in bed for four days. At this time a diagnosis of appendicitis was made, a mistake that to our knowledge has happened not rarely. Since then he has had four other attacks of the same character, sudden, sharp pain in the appendical region, radiating to the back and toward the right testicle. There was no vomiting and no fever with these attacks. During the last two months he has had many shorter attacks of



such pain; they were followed by frequent desire to urinate.

Examination of the patient: Mr. S. is a well developed, healthy appearing man. The only thing of note is that on palpation the region over the right kidney and ureter is tender and painful. His urine is cloudy, contains a trace of albumen, many pus cells, and a few red blood cells. On the 18th of February, a cystoscopic examination was made. A ureteral catheter could be introduced into the left ureter easily; the right ureter was swollen and reddened, and the ureteral catheter could not pass beyond a half inch from the ureteral opening. A radiograph taken by Dr. Hickey at this time showed a calculus in the right ureter low down in the pelvis. (See radiogram.)

Mr. S. was sent to Harper Hospital and operated the 18th of March, 1908. It was decided to remove the stone by the transvesical route, and the bladder was opened suprapubically. The stone could be easily felt and moved about with the bladder wall, but it could not be dislodged either upward into the ureter or downward into the bladder, in spite of long manipulation. It was also impossible to catch the stone by small alligator forceps introduced into the ureteral opening. Splitting of the ureteral opening was not deemed advisable, as it did not seem to be possible to overlook the field sufficiently if control of hæmorrhage was needed. From the fact that two fingers introduced into the bladder could move the bladder-wall with the stone in the ureter, freely in the lower pelvis, it occurred to me to make a small intraperitoneal incision and have my assistant push the stone from within the bladder with his finger toward the intraperitoneal incision. According to this idea a second incision two inches in length was made one inch above and parallel to the middle of Poupart's ligament, through skin, fascia, and muscle. The peritoneum was pushed inward, and after detaching the peritoneum a little more with a gauze sponge, the stone, embedded in the ureter, appeared in the wound, guided there by the two fingers of my assistant introduced into the bladder. It was easy to incise the ureter over the stone, it being

steadied in the wound by the assistant's fingers, and extract the stone, which was about the size of an olive pit. Both bladder and ureter were then drained. The wound closed in about two weeks. Patient was discharged cured three weeks after operation.

In conclusion this method seems to have many advantages. Even with all the modern instruments for transvesical operations many cases will be found like the one mentioned where the transvesical removal of the stone is impossible. The vaginal route could only come into consideration in the female, and then it is often followed by long standing fistulas. The rectal route does not correspond with our aseptic principles. "The perineal and sacral routes which have been recently devised for the removal of stones low down in the ureter are not to be considered." (Ransohoff in Keen's Surgery.) The extraperitoneal route alone, as every surgeon knows, requires a long, formidable incision to overlook the anatomy and the relationship of ureters to iliac and spermatic vessels well, and to reach the ureter lying deep in the small pelvis. From the experience in this case, I was very much surprised as to the ease with which the stone could be brought into a small extraperitoneal incision. While the original depth of the stone, if searched only by extraperitoneal incision, is between five and six inches, by this combined method the stone could be brought within two inches of the surface through an incision between two and three inches long. It would have been also possible to have stitched the ureter and bladder primarily, but on account of the long manipulation which had been gone through in trying to remove the stone by the transvesical route alone, we deemed it advisable to drain in this case. The accompanying sketch will illustrate clearly the technique of this method.

SOME POINTS IN THE OPERATIVE TECHNIQUE OF VAGINAL HYSTERECTOMY FOR PROLAPSUS

By THOMAS S. CULLEN, M. D., Baltimore, Maryland

It is not my intention to discuss here the relative merits of the various abdominal or vaginal operations for prolapsus of the uterus. Marked prolapsus usually demands operative interference. If the patient comes prior to the menopause, the uterus should be preserved if possible, and even in women who have passed the menopause it may sometimes be deemed wiser to save the uterus on account of the probability of a prolapsus of the vaginal vault at a later date. In a certain number of cases, however, there is marked prolapsus of the uterus associated with much redundancy of the anterior and posterior vaginal walls and occasionally with a greater or less amount of ulceration. In this group of cases vaginal hysterectomy combined with a wide removal of the surrounding vaginal mucosa, closure of the vaginal vault and repair of the perineum, as described in the following paragraphs, gives excellent results.

The accompanying case was the first in which we employed this procedure.

Vaginal hysterectomy with wide excision of the vaginal mucosa in a case of extensive prolaspus uteri with ulceration of the cervix and vagina.

Mrs. E. L., aged 72, white, seen in consultation with Drs. Chapman and McCormick of Trappe and Brice Goldsborough of Cambridge, Md., March, 1905. This patient for 52 years has been suffering from prolapsus of the uterus, but never told her physicians about it until a few weeks ago. Until recently she has gotten along without much difficulty.

Accompanying the prolapsus is marked descensus of the bladder. The cervix (Fig. 1) is greatly thickened and there are teat-like projections from its surface. A long scar seven or eight cm. in length extends up the right side of the cervix along the vaginal vault. On the left side is a similar but smaller one not completely covered over with epithelium.

Fig. 1. *Marked prolapsus of the uterus.* The cervix is much enlarged and springing from it is a teat-like projection more than 1 cm. long. On the right side of the cervix and extending far out on to the vagina is an area of ulceration. A similar but smaller one is noted on the left. On the anterior vaginal wall are two small ulcerated areas. The dotted line indicates the outline of the incision. It passes through the vaginal mucosa but no farther. After it has been determined just how much vaginal mucosa should be removed with the cervix, this incision is carried completely around the cervix. In this case all the ulcerated area was naturally included and posteriorly a flap of vaginal mucosa 7 cm. broad was removed with the cervix.

I outlined the area to be removed at the commencement by cutting just through the vaginal mucosa all the way around as indicated by the dotted line. I then dissected the vaginal mucosa downwards from the bladder, entered Douglas' cul-de-sac behind in order that I might get my bearings (Fig. 2), removed the uterus and joined the vaginal mucosa to the peritoneum of Douglas' pouch (Fig. 3). The peritoneum of the anterior pelvic wall was then sutured to that of the posterior wall, and in this way the pelvis was completely shut off (Fig. 4).

Path. No. 8459. The specimen consists of a prolapsed uterus together with a large cuff of vaginal mucosa. The cervix itself is 7 cm. wide, and 5 cm. in its anteroposterior diameter. Surrounding the cervix is a cuff of vaginal mucosa varying from 2 to 7 cm. in breadth.

In such a case as this one finger in the pelvic cavity is of the greatest assistance. After the area to be removed has been outlined and the vaginal mucosa has been carefully dissected downwards in front, care being taken not to enter the bladder, an incision is made behind the cervix and Douglas' pouch is entered. The left index finger

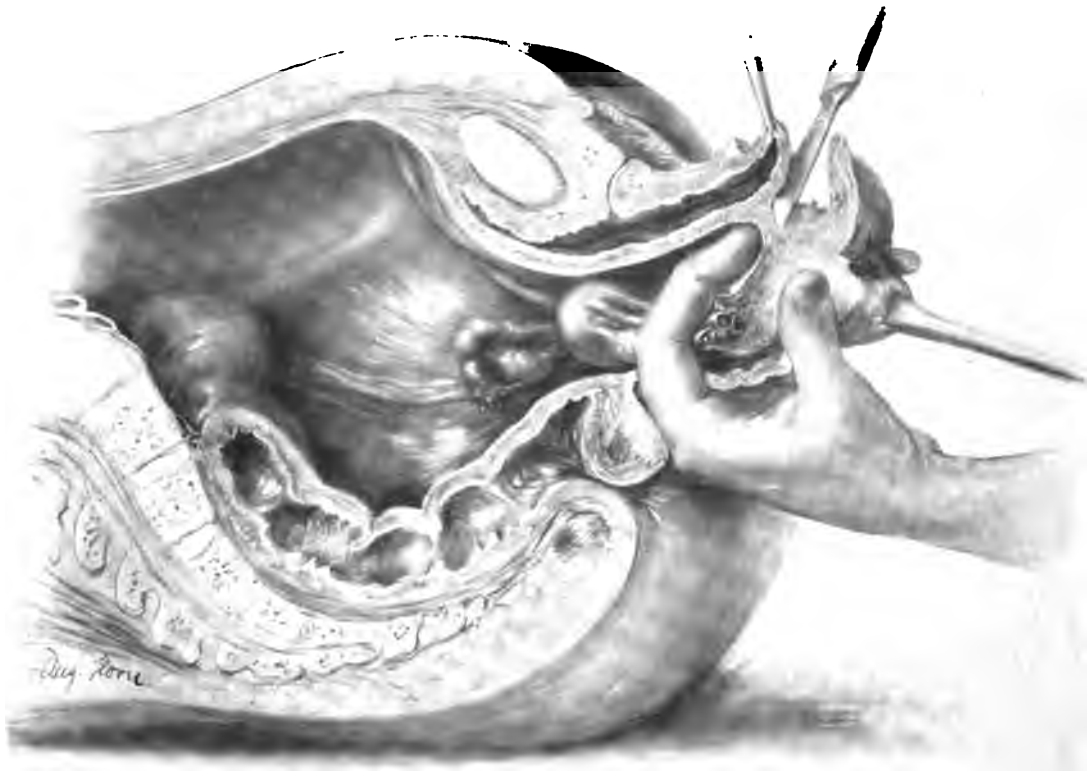


Fig. 2. *The finger as a guide in separating the bladder from the cervix.* The vaginal flap was dissected downwards from the bladder. Douglas' pouch was then opened up along the dotted line, and the left index finger carried down in front of the cervix tended to shove the bladder upward and away from injury while the knife dissected it from the cervix. In this case the tissue between the bladder and cervix was denser than usual.

can be passed through this opening, hooked over and carried down in front of the cervix between it and the bladder. The knife gradually cuts down upon this at a fixed point. By the employment of this method there is much less danger of injuring the bladder (Fig. 2).

After control of all the blood-vessels and removal of the uterus with or without the appendages, as is deemed advisable, the peritoneum of the pelvis is drawn down and attached to the vaginal mucosa. In this way the stumps of the vessels are completely covered over and nothing but a small opening persists between the pelvis and the vagina. When one removes a large area of vaginal mucosa, as in this case, and then joins the peritoneum to the vaginal mucosa, the remaining portion of the vagina is drawn up as it were into the pelvis, no slack being left (Fig. 3), and the bladder which has been prolapsed is again carried up into a relatively normal position.

It is comparatively easy to join the peritoneum of the posterior part of the pelvis to that of the anterior part. By means of several sutures introduced at different levels the peritoneal surfaces are approximated over a considerable area and the now shallow vagina is completely cut off from the pelvis. Care must be taken when suturing the peritoneum not to pierce any of the large vessels, otherwise troublesome oozing or a hæmatoma may follow.

We have removed the uterus in this way in several instances with great satisfaction. The method is applicable chiefly to those cases where marked prolapsus exists.

If the tissues are not brought up quite as snugly as one would wish, the perineum may be repaired.

Fig. 3. *Appearance of the lower part of the pelvis after the pelvic peritoneum has been united to the vaginal mucosa.* The pelvic peritoneum has been joined to the vaginal mucosa by means of interrupted catgut sutures and the stumps of the vessels have been covered over. The bladder has been drawn well up and the vagina is much shortened.

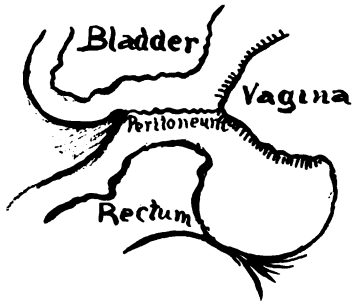


Fig. 4. *Closure of the pelvis.* The pelvic peritoneum is united over an area from 2 to 3 cm. long, care being taken not to pierce any vessels. If the vagina is lax, the perineum should be repaired.

I thought that this operation was original (if any vaginal hysterectomy can really be considered new) until my visit to Rochester a few years ago. There I saw Dr. Wm. J. Mayo do an operation somewhat similar in character, the only differences being that he did not take out so large a cuff of vaginal mucosa surrounding the cervix as we have done, and that Douglas' pouch was not at once opened up and a finger introduced as a guide. These, of course, are only minor differences.

IMPROVED TECHNIQUE FOR REMOVAL OF COLLAPSED VULVO-VAGINAL AND OTHER CYSTS AND HERNIAL SACS[1]

By ALBERT J. SCHOENBERG, M. D.
Surgeon to the Evangelical Deaconess Hospital; Instructor in Gynecology, College of Physicians and Surgeons, Chicago, Illinois

Experience teaches and authorities are agreed that the dissection and removal of collapsed cysts and adherent hernial sacs may be difficult.

In the case of cysts, it is important to remove the sac entire to effect a permanent cure. It is not difficult to follow the outlines of the sac in its ramifications when filled with its contents, but in many instances the cyst wall is so thinned that rupture takes place and contents escape, when it becomes most difficult to differentiate the cyst wall from surrounding tissues; this results in incomplete removal of the cyst wall and posssible injury to important surrounding structures.

In case of rupture, to again put the sac under the favorable conditions that existed before its rupture, the author has made use of gauze packing to distend and outline the sac, as illustrated by the report of the following case:

The patient, Mrs. F., presented herself for medical relief suffering with pain and swelling of the left labia. Upon examination, a large vulvo-vaginal cyst was found, which, according to her statement, had been operated upon thirteen years previously, and recurred some ten years later.

Operation. An incision was made through the skin surface of the labium down to the cyst wall. The dissection was slowly and carefully made, with especial

[1] Read before the Mississippi Valley Medical Association, October 14, 1909.

efforts to avoid rupturing the cyst, but in separating posteriorly it ruptured. A light artery forceps was clamped across the opening; this held for a short time but the sac soon ruptured again. The contents were then allowed to escape, and the cavity packed with strips of gauze; this outlined the cyst wall perfectly and greatly facilitated its removal.

This same method may be very advantageously made use of in the isolation and separation of hernial sacs when adherent or congenital, especially if the sac be thin and ill-defined, or when treated with irritant injections.

The following case gave an unusual opportunity for testing the advantage and feasibility of this method:

Mr. P., aged thirty-three, well nourished; family and personal history negative. At the age of twenty-four, after severe exertion, he first noticed the hernia. He was treated by irritant injections and was apparently cured for about six months, during which time he did all kinds of hard manual labor. At the end of this time the hernia reappeared, and since then has slowly increased in size.

Operation. An incision through skin and superficial structures was made, the external ring located, and the aponeurosis of the external oblique was slit in the direction of the inguinal canal just above the internal ring. The aponeurosis of the external oblique was dissected back and isolation of sac attempted, but the isolation and separation proved to be so difficult that after separating adhesions and removing scar tissue, and masses of tissue containing a putty-like substance varying in size from a filbert to a pecan, it was thought inadvisable to further bruise and tear the tissues. The neck of the sac was then exposed and opened, the contents returned into the abdominal cavity and the sac packed toward the distal end with strips of gauze until it was well filled. This outlined the walls perfectly, so the separation from the cord was greatly simplified.

This method has been used in subsequent cases and may be used for removal of cysts in any region,

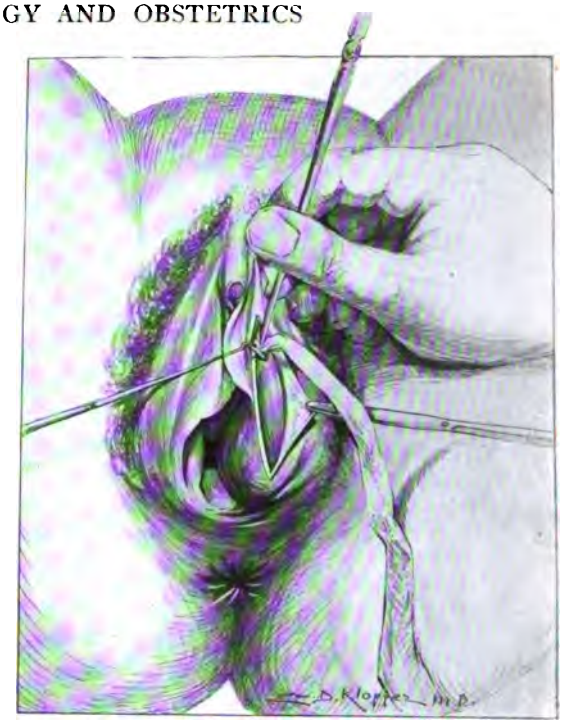


Fig. 1. Introducing the gauze.

as for instance broad ligament pancreatic cysts, and other cysts.

The advantages of this method are:

A complete removal with much less difficulty by the use of the packing, and the cyst can be removed intact, while bruising and tearing of tissue is minimized.

A NEW DEVICE FOR SUPPORTING THE ARM

By ARTHUR BARNETT EUSTACE, M. D.
From the Clinic of Professor John B. Murphy, Mercy Hospital, Chicago

Some fifteen years ago Dr. A. Radcliffe of Waukegan, Illinois, devised an appliance which he called "A New Axillary Splint," a description of the device appearing in the American Medico-Surgical Bulletin, September 1, 1894. The splint was originally intended to prevent cicatricial contraction following injuries about the axilla and to relieve the patient from confinement in bed.

The writer has made several modifications of this device, and also believes that it is an ideal apparatus which may be used in a great many surgical conditions other than that for which it was originally intended.

The splint consists of four parts, viz.: a belt with strap and buckle, three forks, a wire frame, and suspenders. The belt is made of a steel band three-quarters of an inch in width, which is padded, covered with leather, and a strap and buckle attached. The forks (see Figure 1) are three in number, each one being made in four parts. The fork itself (*a*) is made of forged steel, both extremities being bent backward and a thumb

screw inserted. The screw (*b*) forms the base, and the top of the loop the roof of an area (*c*) through which the wire frame for the arm passes. A steel rod (*d*) passes down from the base of the fork proper, the lower end of which is threaded and fits into a brass cylinder (*e*), which is likewise threaded, thus allowing one to regulate with ease the height of the forks as well as to adjust them perfectly to the arm. At the lower end of the brass cylinder a smaller fork (*f*) fits on to the belt and is fastened to it with a screw (*g*) below.

The wire frame is made of heavy copper wire bent at a right angle to conform with the arm when flexed at the elbow.

The suspenders are made of canvas and extend from the posterior portion of the belt over the shoulders and are fastened to the anterior portion by a strap and buckle. The device is easily adjusted in a few moments, so that it may be used for either the right or the left arm.

The application of the splint is a very easy matter. The belt is fastened around the waist at a level with the iliac crests and the suspenders then fixed in position and strapped so that they will support the weight of the arm when placed in the wire frame. The latter is then covered with a roller bandage which extends back and forth from the wire on one side to that on the other. This bandage is applied loosely, which allows it to form a trough in which the arm is placed, its position being as shown in Figure 2.

I believe the splint described above will form a perfect support for the arm and may be used in

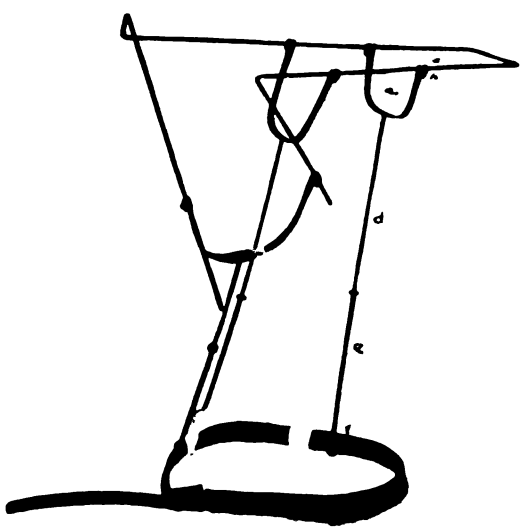


Fig. 1.

Fig. 2.

all conditions where œdema or inflammation are evident. It might be well to note at this point a few of the surgical lesions for which we believe the splint to be adapted.

1. Fractures of the bones of the forearm.
2. Dislocations at the wrist and at the elbow joint.
3. Crushing injuries of the forearm.
4. Lacerated wounds of the forearm.
5. Burns involving the arm, the forearm, or the axilla.
6. Following the application of skin grafts to the arm, the forearm, or the axilla.
7. Following plastic operations upon the arm, forearm, or axilla.
8. Following operations for carcinoma of the breast, especially when a radical operation is made with axillary dissection.
9. Following operations on the arm, forearm, and axilla, such as (*a*) tendon suture; (*b*) nerve suture or operations upon the cervical or brachial plexus.
10. Following operations for osteomyelitis of the radius, ulna or humerus.
11. Infections of the hand and arm.
12. Injuries about the axilla, viz.: Lacerated and incised wounds and abscesses involving the axillary glands which have been incised and drainage instituted.

This splint will form a perfect support for the

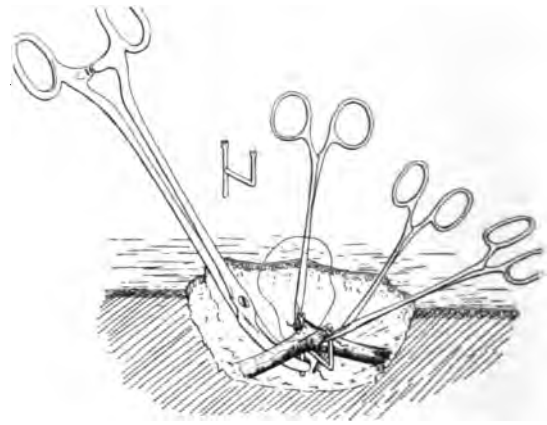
arm, hold the extremity in a fixed position and relieve all tension upon sutures. The device is not an expensive one and can be made by any village blacksmith. The patients who have worn them are emphatic in their statements that the splint is perfectly comfortable.

I wish to express my best thanks to Professor Murphy for his co-operation and kindness in allowing the author to use this splint upon patients in his clinic, and also to acknowledge my indebtedness to Miss Mildred Van Aken for the photographs reproduced above.

AN AID TO VESSEL SUTURING

By STERLING BUNNELL, M. D., San Francisco, California

This instrument is to hold the edges of the two vessel ends in position while the continuous suture is placed. No hands of an assistant are in the way holding guide sutures, and the edges to be sewed are held steadily and firmly and in perfect position. The instrument is held by a heavy clamp or needle-holder that rests on the field of operation. Two of the guide sutures, with mosquito hæmostats attached, hang over the notches while the third is pulled down by the weight of its hæmostat. The notches should be smooth and rounded to avoid cutting the delicate thread and for the same reason the points of the hæmostats should be covered with fine rubber tubing. They should hold the thread close to the notches. The instrument is especially useful when sewing vessels that are down deep in an incision. Here the clamp and hæmostats may, when banked up with towels,



slope steeply into the wound, and the sewing may be done with thumb forceps.

TRANSACTIONS OF SOCIETIES

WESTERN SURGICAL AND GYNECOLOGICAL ASSOCIATION

NINETEENTH ANNUAL MEETING, HELD AT OMAHA, NEBRASKA, DECEMBER 20 AND 21, 1909. THE PRESIDENT, DR. ARTHUR L. WRIGHT, CARROLL, IOWA, IN THE CHAIR

The association met at the Rome Hotel, and was called to order by the chairman of the local Committee of Arrangements, Dr. John P. Lord, who delivered a brief address of welcome.

GASTROINTESTINAL SURGERY

DR. THOMAS C. WITHERSPOON, of Butte, Montana, called attention to an occurrence which he believed threw some light on the question of paralytic conditions observed in the stomach and bowels, and reported the following case as an illustration.

A man, previously healthy, except for gastric symptoms, wiry and active, suffered from gastric ulcer of a chronic type. The ulcer was not situated in the pylorus, but to the left, and there was no obstruction to outflow from the stomach, nor was there dilatation. Eight days after a gastroenterostomy the stomach became acutely dilated until its lower curvature reached the pelvic cavity. A second operation, done because of the dilatation, nine days after the first, proved the duodenum was normal; the bowels were flat, the gastrojejunal opening still patulous, and there was no point of obstruction beyond the stomach which could be discovered. There was also no evidence of inflammation of the stomach or intestinal wall or peritoneum. A gastroenterostomy was performed and the fluid in the stomach had to be removed by pumping it out, as the stomach was completely paralyzed. The original incision in the epigastric area was not healed after eight days. It opened without instrumentation immediately upon snipping the stitches at the second operation. On the ninth day this man suffered considerable pain in the stomach area and behind to the left. Following the gastrostomy the pain ceased. The epigastric incision through which both operations were done was closed at the second operation by through and through silkworm gut stitches, and healed without the slightest inflammatory reaction.

The conclusions to which he came after observing this case were: "(1) The acute dilatation was the direct result of a paralysis of the stomach wall. (2) The lack of healing in the epigastric incision following a careful closure at the time of the first operation, and not associated with an evidence of infection, must be attributed to a trophic disturbance. (3) The stomach and epigastric abdominal wall are both innervated by the same spinal segment. It was a matter of logical deduction that the central apparatus was responsible for disturbance in both stomach and wound. (4) Some toxic agent only could have become so rapidly operative after eight full days of a normal condition following the operation, and this agent must have produced its effects by acting upon the ganglionic nerve cells in the spinal segment. (5) This toxic agent most probably took its origin from an abnormal fermentation within the bowel, or the liver failed to render harmless some produce absorbed from the bowel lumen."

He believed the majority of cases of gastromesenteric ileus took their origin from a like disturbance in the cord, and knowing how readily the gastro-enteric process might be disturbed by factors both local and remote, it became an easy matter to concede that a broken limb, an injury to the head, a severe nervous shock, as well as dietary indiscretion, and direct surgical attacks upon organs located in the abdominal cavity might be followed by stomach or intestinal paralysis.

In the last two and a half years he had had forty-six cases of general peritonitis following perforation of the appendix and of stomach ulcer get well. In these cases a continuous proctoclysis was not practiced save in two of them. The method of administering the water was that of intermittent injections into the rectum, averaging about sixty to eighty ounces in twenty-four hours. Where the patient's condition allowed removal of the appendix or closure of the ulcer and the establishment of pelvic drainage, they recovered. During this period he had had five deaths where simple drain of the pelvis was all that was done, due to the extreme condition in which the patient was brought to him. They all agreed as to the value of introducing water per rectum and keeping

the stomach empty, but he thought too much stress had been laid upon the value of continuous proctoclysis, using physiologic salt solution. The Fowler position with pelvic drain seemed to be the life-saving factor in general peritonitis.

DISCUSSION

DR. LEONARD FREEMAN, of Denver, Colorado, stated that Dr. Witherspoon had called attention to dilatation of the stomach which took place without apparently mechanical cause, and he attributed to some of these cases the action of bacteria upon the nervous system. That might be true, but he somewhat doubted the absence of mechanical cause in addition to the action of the bacteria on the nervous system. They knew that there were certain individuals who had stomachs which were difficult to empty, and that difficulty in emptying the stomach was due perhaps to a sagging of the intestines, large and small, particularly the large intestine, in pulling down upon the stomach and to a certain extent influencing the pylorus. Such cases occurred once in a while and accounted for many difficulties in the emptying of the stomach. He thought if they were to trace these cases of dilatation of the stomach, they would probably find in the stomach of those people who had had such dilatations some difficulty in the emptying of the stomach originally. Some time ago he operated on a very simple pelvic case which was followed by dilatation of the stomach clear down to the pelvis, and which resulted in the death of the patient. The autopsy showed that there was no absolute obstruction to the pylorus. There was no obstruction of the intestines themselves, and yet a fresh adhesion took place at the site of the pelvic operation to the omentum, which pulled upon the large intestine, and that in turn pulled upon the gastrocolic omentum to such an extent as to shut off the pylorus. This was demonstrated at the autopsy and accounted for the fact that the stomach had dilated to a certain extent. He thought a combination of these things, namely, a stomach which did not empty itself very readily, combined with a toxæmia and possibly with some pelvic affection, would serve to explain these cases better than to adopt the theory that the trouble was entirely nervous.

DR. CLIFFORD U. COLLINS, of Peoria, Illinois, stated that he was interested in the reference which was made to the separation of the abdominal incision. Madelung some years ago reported a number of cases in which separation of the abdominal incision had occurred, and came to the conclusion that the kind of suture material used for closure of the wound had nothing to do with the separation. Dr. Emil Ries a few months ago reported three cases in which separation of the incision had occurred. The separation began at the peritoneal layer, and there was a gradual separation until the skin was reached, the skin being the last process in the separation. He would like to ask Dr. Witherspoon whether in the first case he mentioned the peritoneal and muscular layers showed any granulating process to indicate that separation had occurred some days before. The second case was rather unique in the fact that separation occurred first in the skin and then the muscle layer. In most of the cases reported the separation had occurred in the peritoneal and muscular layers.

DR. CHAS. H. MAYO, of Rochester, Minnesota, stated that as to acute dilatation of the stomach, he understood Dr. Witherspoon to recommend gastrostomy for the treatment of this condition. In the cases reported the stomach was greatly distended and flaccid and so paralyzed that it would not empty through the incision made into it, and the contents had to be pumped out. A great many more cases of dilatation of the stomach occurred than was generally believed, and he would recommend the more frequent use of the stomach tube. In most cases the stomach tube was applied in the post-operative treatment of his surgical cases when vomiting occurred or sick stomach existed. When these patients were not doing well it would be found many times that there was so much paralysis that there was no effort on the part of the stomach to empty itself, and yet it would be found to contain half a pailful of fluid, the pressure of which on the abdominal wall had a great deal to do in producing anæmia of the area of the blood supply which promoted healing, so that if they had an internal pressure beneath the suture line, limiting the capacity of the abdomen, they would have slow healing, and when they wanted to reoperate, if they cut the sutures, the wound readily opened, and it quickly healed after distention was relieved. Oftentimes the distention could be relieved by resorting to the stomach tube without a secondary operation, and he thought a little more stress should be laid on that point.

DR. I. B. PERKINS, of Denver, Colorado, stated that they all knew that it was usual to have considerable nausea following anæsthesia, and for several years he had made it a practice to put the patient in the high Fowler position, and he found in that position patients had much less nausea, they could take water freely, and it passed readily into the intestines, and he found there was much less dilatation of the stomach in these cases than

he formerly had. He had had occasion to experiment a little on himself in this line. He took an anæsthetic to determine whether or not it was the psychic effect of position, or whether it was due to his theory of drainage. At any rate, he had had no nausea after he was put in the Fowler position.

DR. CHAS. H. WALLACE, of St. Joseph, Missouri, stated that he thought they all agreed that the failure of union of abdominal incisions, or incisions anywhere, was due to sepsis, no matter whether the sepsis be pre-operative or post-operative. There was another condition which he had encountered two or three times in the failure of union of the abdominal wall, which he thought was a factor in these cases, and that was the condition of the blood of the patient before operation. He recalled two cases in which there was pronounced anæmia, although operation was imperative, and there was failure of union in other constitutional dyscrasiæ, such as chronic nephritis, and where they were compelled to operate on such patients the wounds might fail to unite on account of the constitutional condition present.

ABDOMINAL CONTUSIONS WITH SPECIAL REFERENCE TO INDICATIONS FOR EARLY OPERATION

DR. L. W. LITTIG, of Iowa City, Iowa, reported four cases of contusions of the abdomen with a view to giving the indications for early operation. The author quoted Hertle, who said that fifty-two per cent of the patients recovered when operated within the first six hours, forty-six per cent when operated during the second six hours, twenty-one per cent when operated during the second twelve hours, and but seven per cent when operated during the second twenty-four hours. A history of the accident, the shape of the vulnerating body, and the direction of the blow were of considerable value. Blows directed toward the spinal column were more apt to result in rupture of the intestine than blows which were slanting and which were directed away from the spinal column.

After discussing the symptoms and diagnosis of abdominal contusions, the author said that if there was a contusion of the abdomen, and if the muscles were rigid, one should operate. Patients might be seemingly well for a number of hours or even days, and that injury to the mesentery might result in gangrene of the intestine and death. Given a case of abdominal contusion, followed by board-like rigidity of the abdominal muscles, which did not quickly disappear, a laparotomy should be immediately performed. This symptom might be absent during shock in the absence of pain, but its absence under these conditions must not be regarded as a favorable symptom. There might be some cases in which necessity for immediate operation was not clear. In such cases do not give opium. There would be other cases which did not seem severe, and in which an operation did not seem to be indicated. In these cases do not give opium.

DISCUSSION

DR. CHAS. W. OVIATT, Oshkosh, Wisconsin, stated that a case recently came under his observation of a man who was struck in the right iliac region with a board from a circular saw. Rigidity was marked from the start, but other symptoms did not develop for forty-eight hours. The patient refused operation, and died. Autopsy revealed that the cæcum was torn loose from its attachment, with a hole in the bowel. No symptoms which would seem to call for immediate operation presented themselves for at least thirty-six hours, and yet this case emphasized the importance of operating early when rigidity was marked.

FOREIGN BODY IN THE INTESTINE

DR. CHAS. W. OVIATT, of Oshkosh, Wisconsin, reported the following interesting and unique case: A Swede, male, aged 53, was admitted to St. Mary's Hospital, February 22, 1908. It was impossible to obtain anything like a clear history of the patient's previous condition, and no account was given of the swallowing of the foreign body. He complained of pain low down in the right side, and upon physical examination a circumscribed area of resistance could easily be made out with pain on pressure at this point. The pulse and temperature were normal. The diagnosis of appendicitis was perhaps too quickly made, but the author's inability to get a clear history of the case was his excuse. Upon opening the abdomen through the outer border of the right rectus, a pointed foreign substance could be easily felt in the cæcum. Through a very short incision into this viscus, a lead pencil, which he showed, seven and a half inches in length, was removed. The appendix was small, presented no evidence of disease and was not removed. On the day following the operation, the patient was shown the pencil and asked if he could account for its presence inside of him. He then remembered that about ten weeks before, while engaged in a game of cards in a saloon, acting in the capacity of scorekeeper, he had the pencil in his mouth and during a fit of laughter swallowed it. He stated that for a day or two following the accident he had some pain in the stomach, but after that had experienced no trouble, and had forgotten the incident entirely.

SECONDARY (POSTERIOR) GASTROJEJUNOSTOMY FOLLOWING RECURRENT ULCER AT THE SITE OF ANTERIOR GASTROJEJUNOSTOMY PERFORMED EIGHT YEARS PREVIOUSLY, TOGETHER WITH STATEMENT AS TO CAUSE OF GASTRIC ULCER

DR. J. F. PERCY, of Galesburg, Illinois, described a case of reoperation for perforation of a gastrojejunal ulcer following an anterior gastroenterostomy performed eight years previously. The ulcer was on the left side of the union between jejunum and stomach. It involved not only the scar tissue of the anastomosis, but also adjacent portions of the stomach and jejunum. The perforation had been sealed by the omentum. He described three things belonging to the intraabdominal picture: *First*, an enormous thickening of the efferent and afferent loops of the attached jejunum; *second*, a perforated gastrojejunal ulcer at the point of the previous anastomosis; *third*, complete burial of the pylorus and adjacent liver region in a mass of dense adhesions. The most striking and insistent thing was the hypertrophy of the jejunum. Its walls were fully two and a half inches in diameter. The operation consisted in removing the jejunum from the stomach wall and closing up the openings, including the ulcer. A posterior gastrojejunostomy was then performed with the short loop. He claimed that this was the first reported case in which this procedure had been followed. He discussed the causes of gastric, duodenal, and jejunal ulcers. He did not believe that hyperacidity accounted for all phases of the causes of these ulcers. He gave the chief role to chronic cholecystitis and referred to a paper read before the Society in 1904 (Journal American Medical Association, July 8, 1905) in which he showed that chronic cholecystitis was not only the cause of ulcers of the stomach and duodenum, but that it was the cause of cirrhosis of the liver in those with no history of alcoholism, as well as of chronic pancreatitis.

DISCUSSION

DR. L. L. MCARTHUR, of Chicago, stated that he was inclined to agree with Dr. Percy as to the influence which an abnormal flow of bile might have in the maintenance of hyperacidity. The bile was naturally the antidote of the acid secretions, and irritation about the gall-bladder would not infrequently influence the condition of the stomach secretions. The theory advanced by Dr. Percy might be further elucidated by laboratory experiments, and he would like to suggest that he have them carried out.

DR. CHAS. H. MAYO, Rochester, Minnesota, stated that this paper brought to his mind one thing, and that was, ten years ago, when there were comparatively few gastro-enterostomies done, surgeons heard more about ulcers of the jejunum in proportion than they did to-day. Out of a good many gastro-enterostomies they found that condition very rare in their own experience. Their experience, however, corresponded to what Dr. Percy had reported, namely, after anterior gastroenterostomy the ulcer has been at the site of the gastro-enterostomy instead of being lower down in the bowel.

DR. PERCY, in closing, stated that he had just completed some laboratory work by which he would try to prove some of the things that were merely visionary now.

DIFFUSE SEPTIC PERITONITIS

DR. BYRON B. DAVIS, of Omaha, Nebraska, stated that the decrease in mortality of acute spreading infection of the peritoneum was due to the recognition of three important factors. *First*, the chief absorption from the peritoneum was carried on by the diaphragm, seconded by the great omentum. *Second*, the Fowler position with free tubular drainage from Douglas' cul-de-sac had proven efficient in turning the current in the opposite direction, thus removing the toxins harmlessly. The *third* important contribution was made by Dr. Murphy in the use of normal salt solution by his efficient method. There were other factors of only less importance, all of which must be recognized in order to get the best results. As the transition from the older methods to those of the present was slower with some of them than with others, he could only include in his series of cases those operated upon since January, 1907. After the exclusion of cases which could not rightly come in the category of the cases under discussion, his records showed that since January, 1907, he had operated on thirty-nine cases of diffuse septic peritonitis, with three deaths. Thirty-five were due to appendicitis, with one death; two were caused by the perforation of a typhoid ulcer, with one death; one was a case due to puerperal sepsis, with an immense amount of free pus in the peritoneal cavity. This woman recovered. And there was one case of perforating duodenal ulcer which ended fatally. Twenty-eight were males, and eleven were females. The average age of all the cases was 26 years and 10 months. The youngest patient was a little boy, aged five years, and the oldest was a woman, aged 48 years, the only fatal case due to appendicitis. The appendix was removed at the primary operation in thirty-two cases. In the remaining three the condition was so serious that it was not thought prudent to do more than simple drainage, and the appendix was

left. Two of them had had their appendixes removed by a subsequent operation. The third one recovered and was still carrying his appendix, but intended entering the hospital to have it removed this winter. In four cases, fæcal fistulæ persisted, which were cured by subsequent operation. There had been two cases of ventral hernia operated on, and he knew of two others with hernia which would be operated on, if troublesome. There were probably others, as he believed ventral hernia was frequent after such prolonged drainage. There had been no case of intestinal obstruction following these operations. The period of convalescence had in a few cases extended over a number of weeks and in two of them four and five months respectively. In the greater number the convalescence had been comparatively brief, not longer than he expected after opening an appendiceal abscess.

Detailed reports of the three fatal cases were given.

A SCIENTIFIC INQUIRY INTO THE PRESENT TREATMENT OF PERITONITIS

DR. ARTHUR E. HERTZLER, of Kansas City, Missouri, reviewed the present treatment of diffuse peritonitis, taking up the various factors which went to make up this treatment, and examined them in the light of established facts in abdominal physiology and pathology. He concluded that the explanation of their mode of action had but limited scientific basis. Most of the papers lauding the effectiveness of the modern treatment were unaccompanied by case reports, but those which were so elucidated showed that the favorable prognosis was dependent largely on the fact that cases were included in the statistics which were in no sense diffuse. The present improved prognosis was dependent on earlier diagnosis of the disease, and a more accurate determination of the exact anatomic relation of the disease, making it possible to accomplish the necessary operative work with the least possible traumatism and loss of time. The Fowler position and the introduction of fluids into the body either by vein or rectum had but a minor influence in the determination of a favorable outcome.

In order to facilitate the grouping of cases of peritonitis, he proposed the following classification: 1. The perforative. This group included those cases in which there was expelled into the peritoneal cavity some of the contents of the hollow viscera without there having been any previous protective reaction on the part of the peritoneum. 2. The progressive, in which there was escape of visceral contents into the peritoneal cavity unprotected by adhesions, but in which the peritoneum had undergone a protective reaction. 3. Imperfectly encapsulated. This type joined the preceding without a sharp line. There were adhesions present in some areas, but there was extension in some direction, e. g., along the cæcum or into the pelvis in appendicitis. 4. The peritoneal abscess, in which there was perfect encapsulation of the infected area.

He asserted that peritonitis was diffuse in the beginning in all cases and the determination of the group to which they would ultimately belong depended on the relation of the factors or virulence of infection and the powers of resistance. The earlier operations were done, therefore, the greater the number of cases which would be operated upon before they had had time to become encapsulated.

DISCUSSION

DR. R. C. COFFEY, of Portland, Oregon, stated that in acute perforative conditions the point of drainage would depend largely upon where the perforation had taken place. In a perforation of the gall-bladder or duodenum the drainage was usually near the median line, or where a patient had been transported a distance and rolled from side to side, it was essential to use the Fowler position, because in putting patients straight up one got the fluids to gravitate to the bottom. Another important feature he wished to call attention to was drainage at the point of suture of the opening. If one sutured a perforated intestine and that intestine was allowed to come in contact with drainage, a fæcal fistula would likely result; therefore, it was important to make drainage remote from the point of suture. It was also important that the intestines be lifted away from the drain and not insert the drain irrespective of its relation to the intestines.

DR. VAN BUREN KNOTT, of Sioux City, Iowa, stated that he agreed with Dr. Coffey that the Fowler position had had more to do with their recent success in the treatment of diffuse septic peritonitis than any other method of treatment of diffuse septic peritonitis which had been employed, although this was somewhat in opposition to the opinion of Dr. Hertzler, who maintained that early diagnosis and prompt treatment should receive the credit. In 1902 he was deeply impressed by Fowler's paper and the position advocated by him in cases of acute peritonitis. Up to this time most of his cases of diffuse septic peritonitis died, but as soon as he began to employ the Fowler position they commenced to get well. Shortly after this he read a paper before the association advocating a stab wound in the median line of the lower portion of the abdomen and drainage

through the retrovesical pouch and drainage through the vagina in cases of diffuse septic peritonitis. Since that time he had invariably employed this method with gratifying results.

DR. DANIEL N. EISENDRATH, of Chicago, stated that there were points in the pathology and etiology of peritonitis which neither Dr. Davis nor Dr. Hertzler had referred to, and as a few of these cases had come under his observation during the past three or four years he thought it might be well to speak of them here. These were the cases in which he had a genuine peritonitis, so far as the pathology was concerned, without visible perforation of the appendix or any other viscus. They were not the cases in which a perforation of the duodenum or stomach had been overlooked, but cases in which streptococci migrated along the lymph channels through the appendix wall and got into the general peritoneal cavity in that way. These cases had occurred not only in his own practice, but in that of others. In looking up a series of cases which they had had at the Michael Reese Hospital in the past ten years, he found there were two of his own, and five others in the practice of Drs. McArthur, Andrews, and Greensfelder. In addition to these, there had been quite a number of cases reported in the literature. They overlooked in little girls a general peritonitis from infective salpingitis. Reidel had recently called attention to this, and had held autopsies on nine little girls who had died of general peritonitis in spite of operation. He found no perforation of the appendix, but simply a very marked and intense salpingitis.

DR. CHARLES H. WALLACE, of St. Joseph, Missouri, stated he noticed that in these cases of perforation of the appendix or perforation of any hollow viscus, if he operated within the first twenty-four or forty-eight hours, the question of drainage was a minor one if he removed the pathology and closed the opening. They knew there was a class of cases that became so septic that they got no drainage, it mattered not what they put in for the purpose of drainage. The wound looked like a wound in a cadaver; there was no exudation of serum, and in this class drainage failed to accomplish anything because the patients were beyond all hope. But in the cases of chronic abscess drainage was of great value.

FURTHER OBSERVATIONS ON ENTEROSTOMY AND ITS TECHNIQUE

DR. JOHN PRENTISS LORD, of Omaha, Nebraska, in his paper reported four fatal cases in addition to the four successive successful cases mentioned last year. In one the enterostomy was done for typhoid perforation peritonitis, death being due to the extension of the peritonitis. Numbers two and three were operated on for appendicitis and peritonitis, death resulting from ileus due to peritonitis. Number four was due to septic ileus. The drainage was practically *nil*, and the condition persisted. Enterostomy was recommended above the line of suture as a vent in resections of the distal half of the large bowel in order to prevent distention from gas, which was responsible for the greater number of failures in the suture of this portion of the large intestine. The simple technique by three pursestring sutures about a large catheter was an easy, quick, and ready means of draining the bowel of gas and fæces. It was life-saving, and might save some otherwise hopeless cases of obstruction due to peritonitis. The fatal cases reported were extreme ones, and the operation was done as the only remaining recourse.

SOME OBSERVATIONS CONCERNING INTESTINAL SUTURING

DR. ARTHUR E. BENJAMIN, of Minneapolis, Minnesota, read a paper on this subject which will appear in a later issue of this journal.

THE PAST, PRESENT, AND FUTURE OF THE WESTERN SURGICAL AND GYNECOLOGICAL ASSOCIATION

PRESIDENT WRIGHT referred feelingly to the death of a former president and co-laborer, Dr. H. D. Niles, of Salt Lake City, and expressed the hope that suitable action would be taken by the members in regard to the loss the association had sustained.

The conception of surgeons in the West uniting and forming an association for the sole purpose of discussing questions of interest to them only, originated with Dr. Milo B. Ward, a specialist doing abdominal surgery in Topeka, Kansas. He quoted Dr. Ward as having said that "to accomplish the purpose of its creation, it was necessary that its membership should be limited; that it should be representative in character, and though its conditions of admission be exacting, they should not be used for a selfish motive. The intention was not to exclude meritorious candidates, but to prove their qualifications, and place a high value on the accumulative results of those associated and working together along scientific lines for a definite purpose, the increase of surgical knowledge and technique, the alleviation of suffering, and prolongation of human life."

The initiative of the association was primarily the betterment of the members surgically, and demanding from the public the respect and confidence their skill merited. This confidence in the

ability of each other had done much to make it possible for the surgeon in the small town to relieve serious emergencies with minimum suffering and loss of life. Formerly the idea prevailed that special skill existed in the densely populated centers only. The tradition was rapidly passing away and the halo of the city *confrere* found no longer than the one at home. Each and every man was better for having been a member of this association. His influence had aided materially in removing the evidence of weakness and in placing the organization on so firm a basis. If this standard be maintained, they must not lose sight of the fact that the honest and conscientious surgeon was not born, but gained his knowledge, skill, and dexterity by persistent, painstaking labor and constant application to a science more sacred than life itself. The qualifications of surgeons differed in many respects, depending on education, environment, personal experience and individuality.

He could not refrain from mentioning the depredating influence of the young specializing in surgery before their mental faculties had fully expanded. This injured the mind and warped the intellect of the student by depriving him of adequate medical and literary training, so essential to the thoroughly equipped surgeon.

In order that its present position be maintained, the credentials of each applicant for membershp should be carefully examined and only those admitted who were known to be proficient in the science and art of surgery through long service, wide experience, and close application to the principles underlying an almost exact science. An effort should be made each year to infuse new blood. This would add vigor, strength, and a new working element that would maintain the association in its present position.

RECENT PROGRESS IN SURGERY OF RENAL CALCULI

By DR. DANIEL N. EISENDRATH, of Chicago. This paper will appear in a subsequent issue of SURGERY, GYNECOLOGY AND OBSTETRICS.

DISCUSSION

DR. M. L. HARRIS, of Chicago, stated that the need of knowing the condition of both kidneys was very important. The frequency of bilateral kidney stones was a fact which was little recognized by most physicians, and only by very few surgeons, unfortunately, because the frequency with which some accident happened to the patient after the removal of the first kidney was very great. It was impossible to determine the existence of bilateral kidney stone by the symptoms, as frequently the symptoms were limited to one side for at least a long time, and by depending entirely on the symptoms one was led to operate on that side and neglect to examine the opposite side. This was forcibly illustrated to him the past week. A patient came to him with a history of renal stone, with repeated attacks of renal colic in the left side, and he sent him to the hospital for the purpose of examining the two kidneys by catheterization. They set an appointment two days ahead. On the morning on which he was expected to make the examination, the patient got to the hospital before he did, and was seized with an attack of acute renal colic on the right side. Up to that time he had no symptoms whatever of involvement of the right kidney, yet on the eve practically of doing something for left-sided trouble, he suddenly manifested evidences of involvement of the opposite kidney. After he had passed over his colic, he catheterized both sides and found both kidneys involved. This case showed that they should invariably examine both kidneys, not only by X-ray, but by separating the urine from each kidney in every case of kidney trouble on which they expected to operate. That was the most important lesson they were to draw from this excellent paper.

DR. LEONARD FREEMAN, of Denver, Colorado, stated that he should like to speak on one embarrassing complication in operating on kidneys for stone, and that was secondary hæmorrhage. It was an extremely unfortunate thing to have operated upon a kidney and successfully removed a stone and have the patient go on in the best of condition for a week or ten days and then begin to have a little blood in the urine, a little more the next day, and still more the next. Such hæmorrhages were not infrequently fatal. The only thing they could do under these circumstances was to remove the kidney, and the sooner that was done in the presence of secondary hæmorrhage the better it was for the patient. That, again, illustrated what Dr. Harris had said, namely, it was absolutely necessary to know, before they extract a stone from one kidney, whether the patient had another kidney or not, and whether that kidney was doing its duty, because in the face of a severe secondary hæmorrhage of this kind it was impossible sometimes to find out the condition of the second kidney. He had had this happen to him twice. Once on the seventh day a hæmorrhage began as a slight hæmorrhage, and the following day a severe one, which almost killed the patient; and in the second case the hæmorrhage began on the ninth or tenth day and a very severe hæmorrhage did not manifest itself until the twelfth or thirteenth day. In each case he did nephrectomy

under desperate circumstances, using salt solution and adrenalin in the vein to resuscitate the patient, and had the satisfaction of seeing these two patients recover. But it was a very close call in each case.

Dr. Arthur C. Stokes, of Omaha, Nebraska, said he had a specimen he should like to show of a stone in the kidney, in which case the symptoms were almost none. Preceding the operation for removal of the kidney the patient was operated on, a diagnosis having been made of floating kidney. An incision was made, going straight through the muscles of the back, and in the attempt to tie the kidney up to the back, a lot of pus was found. The surgeon was not prepared to remove the kidney. The patient subsequently came under his care and the kidney was removed. This patient had practically no symptoms, yet the kidney was almost entirely destroyed. The parenchyma was almost entirely gone, leaving only fibrous tissue here and there. The stone remained in the kidney as it was. On the removal of the kidney, about a quart of pus came out of its pelvis and around the kidney. The kidney pelvis was practically destroyed. He wished to emphasize the great care that should be taken in the diagnosis of renal stone. There was no symptom nor set of symptoms pathognomonic of kidney stone. It had happened to him several times to have made an absolute diagnosis of stone in the kidney, and yet on opening no stone was to be found. This was embarrassing. Now that they had the use of the X-ray in kidney stone work, they were able to differentiate a stone in the kidney from pyonephrosis, pyelonephrosis, and so forth.

Dr. Chas. H. Mayo, of Rochester, Minnesota, stated that there was no major operation which was undertaken with less working out of details than operative procedures on the kidney. Many times they would see very good surgeons undertake an operation of the kidney just because there was a tumor, when it would only take a little more time to determine the functional capacity of both kidneys and see if any emergency existed, like Dr. Freeman reported, for a stone operation. When one became advanced in kidney stone work he felt that he must determine the functional capacity of each kidney, and feeling, above all things, that in some instances he must preserve the kidney after removing the stone.

Anomalous blood-vessels were encountered in kidney work. These were not uncommon, although it was only lately they had been getting on to the fact that they were present.

Dr. A. W. Abbott, of Minneapolis, Minnesota, stated that with regard to the anatomy of the kidney he wished to say that Dr. McArthur of Chicago had reported a case in which the blood supply was from the external iliac; while in a case of his own the supply was from the internal iliac. They were both congenitally placed kidneys.

MOVABLE LIVER AND CONSTRICTION LOBE OF THE LIVER

Dr. M. L. Harris, of Chicago, said that movable liver was found in two classes of patients, namely: Those in whom the movable liver was the chief or only abnormal condition present, and those in whom it was but a part of a general visceral ptosis. In the former class the condition was probably due to congenital defects of the attachment of the liver, while in the latter class the loss of the support affected by a firm abdominal wall, together with a gradual yielding and elongation of the attachments of practically all the abdominal organs, played an important part in the condition.

Constriction lobe was a very common condition, being found according to Leue in 1.9 per cent of the male, and 25.3 per cent of the female subjects over sixteen years of age, posted by him, 3,484 in number.

Both movable liver and constriction-lobe might give rise to symptoms which were quite distinct and often very distressing, relieved only by properly suturing the liver in place, or by suturing the floating lobe to prevent its abnormal mobility.

DISCUSSION

Dr. R. C. Coffey, of Portland, Oregon, made it a point to fix a movable kidney where it could always be felt with the hands afterwards; and the women did not have pain and redisplacement, and the results were good. As regarded the liver, in twenty-two cases of gastroptosis, he found the liver displaced in four cases sufficiently to require suture; but his technique had been a little different from that of Dr. Harris, in that he did not believe it was necessary to scarify the liver. In the cases he had had there had been no displacement.

Dr. James E. Moore, of Minneapolis, mentioned the case of a woman, a neurasthenic, who was confined to bed most of the time, complaining of a tumor in the lower abdomen. He found the right end of the liver was loose, so that when she turned on the liver side the edge of the liver ran up and down, the organ being pushed over to the middle of the abdomen. Shortly after suturing the liver in place the woman got out of bed and had been traveling all over the United States and other countries ever since.

Dr. A. F. Jonas, of Omaha, said that at a meeting in Chicago he reported three or four cases of ptosis of the liver where the margin of the liver descended four fingers' breadth below the right

costal margin. At that time he had used the gall-bladder as a suspensory ligament. The patient was placed in the semi-Trendelenburg position, and the liver pushed up as far as it would go, and sewed with the gall-bladder to the upper margin of the incision, which was extended up against the costal arch. This operation was successful. He had occasionally done that operation since, but in no case except in those where the liver could be pushed in its normal position.

TWO CASES OF OPERATIVE REMOVAL OF CERVICAL RIBS

DR. S. C. PLUMMER, of Chicago, said the first patient was a woman, twenty-four years old. Symptoms began eight years previously and consisted, at first, of pain extending from the axilla to the middle of the ulnar side of the forearm. Four years ago weakness of the hand and later some muscular atrophy appeared. Pain was aggravated by slight exertion. No anæsthesia.

The second patient was a woman, thirty years old, whose symptoms began twenty years ago. Pain in this case was confined to the ulnar side of the forearm. As in the first case, it was aggravated by exertion, but was also brought on by exposure to cold. She also suffered from coldness of the extremity. There was atrophy of the thenar and interossei muscles. No anæsthesia.

Both of these cases had bilateral cervical ribs, as shown by the skiagram, but in both the symptoms were confined to the right upper extremity. The first patient was operated upon March 16, 1905, and her case was included as case 37 in Keen's article, published in the *American Journal of the Medical Sciences*, February, 1907.

The second case was operated upon September 22, 1909. In each case an incision extending obliquely upward and backward for about three inches from just above the right clavicle at the outer border of the sterno-cleido-mastoid muscle, was employed. The first patient reported December 14, 1909, that she now had very little pain, but that the strength of her hand had not improved. The second patient was almost entirely free from pain one month after the operation, but was still somewhat sensitive to cold.

DISCUSSION

DR. JAMES F. PERCY, of Galesburg, Illinois, said four years ago he saw three cases of cervical rib in one year, one of them in a girl, fourteen years of age. The second was a girl, sixteen years of age, and in this case the cervical rib was also on the left side, as in the first case. It was discovered by the dressmaker, and the patient came to him because of swelling. The third case was in a girl, 20 years of age, who had the condition on both sides. Not one of these patients had been operated on up to date.

DR. L. L. MCARTHUR, of Chicago, had seen a case of double cervical rib which produced atrophy of the muscles of the hand and double drop-wrist, but unattended by pain. Operation was refused.

DR. A. F. JONAS, of Omaha, reported a case of cervical rib in a young woman, 21 years of age. She had a swelling in the left side of the neck, which was tender and hard and had been diagnosed as sarcoma of the cervical vertebra. The rib could be seen pressing underneath the skin. He cut down upon it and found running over it what he thought was the common carotid artery, but it proved to be the subclavian artery. He reported this case to call attention to the anomalous course of the subclavian artery on the left side, in this particular case.

DR. HARRY M. SHERMAN, of San Francisco, reported the case of a woman, 30 years of age, who complained of pain in the arm. Cervical rib was suspected on account of the character of the pain. The rib could be felt, and a skiagraph showed its presence. It was removed, and the pain and disability symptoms disappeared. Later, during pregnancy, the pain had recurred. He was anxious to see whether this pain would disappear after confinement.

HERNIA: WHAT CONSTITUTES A PREDISPOSITION?

DR. A. F. JONAS, of Omaha, Nebraska, in his paper drew the following conclusions: 1. All deductions as to predisposition to hernia that were based on the direction and size of the inguinal canal, a large external ring, were untrustworthy. 2. All opinions as to predisposition based on the vague ideas of muscular weakness, reduced abdominal resistance, and diminished support of connective tissue structures, were unreliable. 3. Retarded descent or undescended testicle favored, a complete or partial non-obliterated vaginal process might be regarded as an anatomical predisposition to oblique inguinal hernia. 5. The non-closure of the vaginal process could not be recognized clinically. 6. It would seem that we were scarcely justified in using the term *predisposition to hernia*, because of the lack of reliable clinical data.

THE FREQUENCY OF CONGENITAL SACS IN OBLIQUE INGUINAL HERNIA

This paper by DR. WILLIAM HESSERT, of Chicago, appears in this issue. (See p. 252.)

SOME ANOMALIES OF THE SIGMOID

DR. L. L. MCARTHUR, of Chicago, presented the histories of two cases illustrating anomalies of the sigmoid. He was in accord with Dr. Clark in not favoring the fixation by suture of such loops to either the anterior or posterior wall, as the potential dangers were almost equally as great as that of recurrence. Were a similar case to be met with, he would make a side to side anastomosis, between the proximal and distal end before restoring it to the abdomen, just as he had corrected a rectal prolapse by anastomosing the drawn-up rectum to the first portion of the sigmoid.

PREPARATION OF PATIENTS FOR PROSTATECTOMY

DR. E. S. JUDD, of Rochester, Minnesota, said the general tendency regarding the preparation of patients for surgical interference was to reduce the details to a minimum, although there were some classes of cases that would do better if they were especially prepared. In reviewing the autopsy findings in cases from the clinic in St. Mary's Hospital which had terminated fatally following operation for the removal of the prostate, he found that the cause of death in practically every instance was kidney insufficiency, and acute nephritis superimposing upon an old kidney lesion, usually chronic nephritis. Because of systemic conditions some of these cases were not good subjects for operation; on the other hand, the poorest subject would sometimes endure a difficult prostatectomy with considerable loss of blood and be in good condition in a few days. As the gland increased in size the amount of residual urine increased until the back pressure, coming gradually, became a constant factor in the function of the kidney. Continued withdrawal of the pressure would throw the kidneys into a condition of acute congestion, and if they were partially disabled the sudden change might prove very serious, resulting in acute nephritis and suppression. To overcome this difficulty he commenced by emptying the bladder with a catheter at stated intervals, gradually shortening the intervals until the bladder was emptied every hour. In his experience it had not been satisfactory to leave catheter in the bladder. No particular advantage was to be derived from special diets, therefore, regular diet was maintained up to the morning of the operation. One ounce of castor oil given forty-eight hours before operation was most satisfactory. Salt solution per rectum soon after operation was an aid in elimination of the kidneys. Looseness of the bowels was most undesirable. The arteries of these patients were hard and inelastic and it was difficult to fill up the circulation. The patients were, therefore, encouraged to take great quantities of fluids for several days before operation. Urotropin given in seven to ten grain doses several times each day for a few days before operation would help the condition and tend to better the quality of the urine. The cystoscope was a valuable aid in the determination of the amount and kind of preparatory treatment. An operation should not be attempted during an acute cystitis or epididymitis. He did not believe it advisable to remove the gland in the stage of acute retention.

LYMPHANGIOMA WITH REPORT OF A CASE OF MACROGLOSSIA AND A CASE OF MACROCHEILIA

DR. A. A. KERR, of Salt Lake City, Utah, stated that where practical, the proper treatment of lymphangioma was excision. In macroglossia, if the swelling interfered with mastication, speech, and deglutition, the proper treatment was partial excision. In macrocheilia, partial or complete extirpation was indicated for cosmetic purposes, as well as a prophylactic measure against infection, or malignant degeneration. In the case reported, by means of a wedge-shaped excision parallel with the long axis of the lip, the latter was reduced to normal size.

FURTHER EXPERIMENTAL DATA ON THE VASOMOTOR RELATIONS OF SHOCK

DR. M. G. SEELIG, of St. Louis, Missouri, stated that in a previous paper he had attacked the wide-spread doctrine that shock was due to exhaustion of the vasomotor centers, and consequent paralysis of the peripheral vascular system. He rested his case on definite experimental date to prove that the peripheral vascular system was not paralyzed.

The present paper was a continuation of the work already reported. The results of his experimental work pointed against the correctness of the theory that shock was a symptom-complex due to vasomotor exhaustion.

OSTEOMYELITIS

DR. JAMES E. MOORE, of Minneapolis, stated that inflammation of the bone was due to infection just as it was in any other tissue, the added symptoms and dangers being entirely due to the density of the structure. The virulence of bacteria was always enhanced by pressure and the denser the tissue the greater the danger of necrosis, because of the early interference with the circulation from the products of inflammation, and as soon as part of a bone became necrosed the sequestrum acted as

a foreign body. That the contusion of bone was the most common exciting cause of osteomyelitis was well established, but that underlying causes were back of that was evident, because all contusions of bone were not followed by infection, and many so-called idiopathic cases occurred with no history of contusion whatever.

The early treatment of acute osteomyelitis was just as much of a surgical emergency as the treatment of acute appendicitis. The diagnosis should be made early and followed promptly by operation. There was no medical treatment for this disease, and poultices and other local applications only led to waste of valuable time. There was but one form of treatment, and that was a free opening into the medulla. An incision through the periosteum might relieve some of the pain, but it was insufficient because it failed to stop the ravages of the disease. By a prompt opening into the center of the bone, drainage was established and the life threatening poison allowed to escape. An efficient opening relieved the pressure, and when made early enough would stop the separation of the periosteum and destruction of the endosteum, thus preventing or limiting necrosis. In a very early operation no pus might be found, but the medulla was greatly congested and protruded into the wound. Under these conditions the trephine opening need not be enlarged.

Chronic osteomyelitis might be the result of an acute attack or might be subacute from the first, when it was very liable to be mistaken for tuberculosis. In those cases following an acute attack an operation should be performed for the removal of the sequestrum as soon as it was separated, which was anywhere from six weeks to four months. The cavity should be thoroughly curetted, washed, and finally disinfected by heat or ninety-five per cent carbolic, the latter being much more convenient, and in his experience eminently satisfactory. The acid should be left in the cavity for three or five minutes, when it should be wiped out and the cavity thoroughly washed with alcohol, after which it should be dried and filled with Moorhof's bone wax in a liquid state. The wax quickly hardened at the temperature of the body, after which the periosteum and soft parts were closed in layers by means of chromicized catgut. A dry surgical dressing should then be applied, the bandage being quite snug, and finally the tourniquet should be removed. His experience with the bone wax was such that he could conscientiously recommend it, for when he had temporarily failed he was confident that the fault was in his technique and not in the method.

CASE OF EXTRAUTERINE PREGNANCY WITH TWINS, COMPLICATED WITH OVARIAN FIBROID ON THE OPPOSITE SIDE

DR. D. W. BASHAM, of Wichita, Kansas, reviewed the literature on this subject, and reported a case.

A DECEPTIVE FORM OF APPENDICITIS IN WOMEN

DR. H. S. CROSSEN, of St. Louis, Missouri, reported two cases, giving the clinical characteristics, the conditions found at operation, the treatment employed, and the final result.

The points of special interest were as follows: (1) The location of the mass in the tubo-ovarian region instead of in the appendix region. In the first case, palpation about McBurney's point showed no trouble there, and in the second case simply the edge of the mass extended to the appendix region. (2) The scarcity of inflammatory symptoms. Each patient was sick several months and quite a mass had formed before any acute symptoms appeared, and when they did appear they were comparatively mild. So marked was this feature that the mass, in connection with the history, gave the impression of a new growth, and it was with that diagnosis that each patient came under my care. This is accounted for in a measure by the extreme chronicity of the inflammation and also by its inclusion in the cæcal wall, as explained in the next paragraph. (3) The apparent intracæcal character of the mass. This was a striking feature and was due to the folding of the cæcal wall about the chronically inflamed appendix. Because of the special relation of the appendix to the cæcum or because of the chronicity of the low grade inflammation, or both, the infiltration and adhesions affected principally the wall of the cæcum adjacent to the appendix. The affected appendix was buried in the overlapped cæcal wall. This is what gave the feel of a mass within the cæcum and affecting its wall, and it was this also which made it so difficult to locate and expose the appendix. This peculiarity is important from the standpoint of treatment, for, unless carefully investigated, such a condition might be treated by extirpation of the cæcum under the mistaken supposition that the mass was intracæcal and malignant or tubercular. This peculiarity helped to account, also, for the dislocation of the mass. As the cæcum with its mass was fairly movable it naturally dropped downward into the tubo-ovarian region. Later, adhesions formed, fixing it in the abnormal location. (4) The slow absorption of the infiltration in the cæcal wall, after removal of the affected appendix. In the first case, absorption of the infiltration in the

wall of the cæcum required nearly a year. In the second case in which pus was found the absorption of the infiltration was more quickly accomplished, requiring only about five months. Fortunately in both women the abdominal wall was thin and permitted of deep palpation; consequently the diminution of the cæcal induration could be accurately followed. The fact that the condition described was likely to lead to mistakes, was illustrated by the following incidents: In an eastern museum a specimen labeled "Absence of the Appendix" showed on dissection the condition mentioned above, i. e., an overlapped cæcal wall enfolding the inflamed appendix. Again, in a case related to me, a cæcum resected for supposed malignant disease, with fatal result, revealed on subsequent examination the condition above described, i. e., the supposed tumor consisted simply of the inflamed appendix surrounded and completely hidden by the cæcal wall.

THE ABUSE OF HYPODERMIC STIMULATION DURING AND AFTER SURGICAL OPERATIONS

DR. HORACE G. WETHERILL, of Denver, Colorado, said the best results and the lowest mortality of the busiest surgeons of to-day were attained by the simplest methods. Careful diagnosis and accurate estimate of the ability of the patient to undergo the operation was made. He was prepared with great care, the anæsthetic was wisely chosen and skillfully given, he was operated upon without avoidable exposure, delays, or hæmorrhage, he was returned to a warm bed, placed in a favorable position, watched by a competent nurse, and let alone. If he was restless and really suffering from shock or severe pain as he emerged from the anæsthetic he might be given a moderate dose of morphine or atropine but, notwithstanding its stimulating and soothing effect, he was ordinarily better off if it could be omitted.

By such methods based upon such reasoning and experimental proof, the greatest surgeons of the century were securing the best results and the lowest mortality ever recorded in surgical literature

DISCUSSION

In the discussion on this paper, which was participated in by Drs. Chas. H. Mayo, Leonard Freeman, and Arthur E. Benjamin, it was pointed out very clearly and strongly emphasized that surgeons in recent years had been gradually letting up on stimulating their patients during the time of operation and afterwards, unless absolutely demanded. A great many hypodermic injections were given patients before or after operation with more harm than good.

SURGICAL TREATMENT OF HYPERTHYROIDISM

DR. W. D. HAINES, of Cincinnati, Ohio, after reviewing the literature, embryology, and anatomy of the thyroid gland, presented evidence to show that the syndrome called goiter was due to overactivity of the adrenals induced primarily by an excess of thyroglobulin in the blood. Discrepancies of opinion in the past were due to a lack of definite knowledge of the actual changes which took place in the gland at the time of observation. Laboratory study had shown a local hyperæmia with increase in colloid and diminished staining reaction, but no gross changes in the gland in the first stage. This was followed by hyperplasia, or the second stage. Imperfect alveoli lined with giant cells and great loss in colloid characterized the third stage, while fibrosis, cell atrophy, sclerotic arterial walls, hæmorrhage, and cyst formation completed the final steps in the destructive process. Basing treatment upon these findings, he advised diminishing the blood supply by ligating two or more of the thyroid arteries in preference to thyroidectomy in the management of cases of hyperthyroidism, with moderately enlarged gland and active symptoms. Ligation was a lighter operation and was not followed by hyperthyroidism. In the operation for the removal of adenoma, or partial thyroidectomy, he kept within the thyroid capsule, thus avoiding injury to the parathyroids and recurrent laryngeals.

INTRATHORACIC GOITER WITH REPORT OF CASES

DR. C. H. MAYO, of Rochester, Minnesota, said the transposition of the thymus and lower poles of the thyroid when forming possibly acted as one of the causes of intrathoracic substernal goiter. These growths usually consisted of diffuse colloid or encapsulated adenoma, and when they were completely detached from the thyroid they were wandering. Most of the symptoms occurred from pressure upon the circulation, the trachea, nerves, or the œsophagus. These tumors were usually associated with an ordinary goiter, and probably one-half of them were discovered through complications arising during a thyroidectomy. As they were often enucleated with great difficulty, their removal might be followed by severe hæmorrhage. Intrathoracic pressure obliterated the space; therefore, drainage should be brief. Twelve cases were reported, six being of the diffuse adenoma, six of the encapsulated variety, with one death from collapse of the trachea, due to a hypertrophied thymus of fifty-six grams in a patient with severe hyperthyroidism.

SCOPOLAMINE AND MORPHINE AS A PRELIMINARY TO GENERAL ANÆSTHESIA. A REPORT BASED ON AN EXPERIENCE OF ELEVEN HUNDRED CASES

DR. CLIFFORD U. COLLINS, of Peoria, Illinois, stated that many erroneous statements had been made in the literature concerning the use of this combination as a preliminary to general anæsthesia, and he quoted some of them which his experience seemed to disprove. He used a tablet containing scopolamine 1-100 grain, and morphine 1-6 grain. A solution was made and the combination injected hypodermically one and one-half hours before the operation. The preliminary was given to all adult patients and all children above the age of eight years. No contraindications had been found for the combination. Its action was beneficial as a preliminary to nitrous-oxide gas as well as ether and chloroform, and other general anæsthetics. Only one patient in the eleven hundred showed dangerous symptoms, and these were soon relieved. His experience seemed to show that scopolamine and morphine as a preliminary to general anæsthesia was a rational procedure, adding greatly to the comfort of the patient by relieving him of all nervous apprehension prior to the administration of the general anæsthetic, by permitting him to sleep for some hours after the operation, and by greatly decreasing the amount of post-operative vomiting; and mitigating the dangers of the general anæsthetic by lessening the amount necessary to produce the desired effect, and by checking the secretion of mucus in the throat.

The following papers were also read: "Duodenal Obstruction with Uncontrollable Vomiting and Surgical Method of Treating It," by Dr. Arnold Schwyzer, St. Paul, Minnesota; "Specimen Showing Pericolonic Membrane" was exhibited by Dr. Howard Hill, Kansas City, Missouri, for Dr. Jabez N. Jackson; "Rhinoplasty with the Aid of a Finger and of Skin from the Chest," by Dr. Harry M. Sherman, San Francisco; "Poliomyelitis, Cause and Best Treatment to Prevent Deformity," by Dr. J. W. Cokenower, Des Moines, Iowa; "Report of a Spinal Cord Tumor," by Dr. William Jepson, Sioux City, Iowa; "Our Present Knowledge of the Pathology of Goiter and Some of the Sequelæ of Its Removal," by Dr. Alanson M. Pond, Dubuque, Iowa.

OFFICERS

The following officers were elected for the ensuing year:

President, Dr. John P. Lord, Omaha, Nebraska.

First Vice-President, Dr. Harry M. Sherman, San Francisco.

Second Vice-President, Dr. L. L. McArthur, Chicago, Illinois.

Secretary-Treasurer, Dr. Arthur T. Mann, Minneapolis, Minnesota.

Chicago, Illinois, was selected as the place for holding the next annual meeting.

CHICAGO SURGICAL SOCIETY

REGULAR MEETING HELD JANUARY 7, 1910, WITH THE PRESIDENT, DR. ARTHUR DEAN BEVAN, IN THE CHAIR

FRACTURE DISLOCATION OF THE ELBOW

PRESENTATION OF THE PATIENT

BY WILLIAM HESSERT, M. D.

I desire to briefly demonstrate a case which illustrates plastic work on the elbow joint, and all those that have done that kind of work know what difficulties are encountered in these old cases of neglected fracture dislocations of the elbow.

The history of this case is as follows: The boy received a fracture dislocation of the left elbow four months ago. When he first came under my care, three months ago, his left elbow was almost completely ankylosed in the extended position. There was very little motion. The X-ray showed the results of the old fracture dislocation; the radius and ulna being displaced backwards. The lower end of the humerus showed the result of irregular displacement of many fragments, and taking it altogether it was a bad looking joint. To attempt subcutaneous manipulation in a case of this kind with a view of breaking up the joint and securing motion was out of the question. It is impossible to tell what ligaments and structures are going to be torn, and one would substitute severe traumatism at another angle for what was already present. I decided on the open operation which was performed as follows: The first incision was made on the outer side of the arm, penetrating through the muscular septum down to the joint. The same was done on the inner side and the joint reached in this manner. Externally and internally the lateral ligaments were severed and the capsule also so far as necessary. With the chisel I separated the bony adhesions so that I could get some motion. Even after everything was loosened up, it was impossible to move the arm more than a few degrees of a circle. I dislocated the end of the humerus out of the wound and removed the articular surface, being conscious, of course, that the epiphyseal line should not be disturbed. I trimmed off and rounded the end of the humerus and when that was done the arm was freely movable, flexible and could be extended. A flap consisting of fascia, with a little bit of underlying muscle, was taken off the outer aspect of the arm with the base downward. The flap was inserted between the ends of the bones and brought out on the inner side and securely fastened with catgut sutures. The fascial flap then made a covering for the denuded end of the humerus. When the operation was completed there was scarcely any lateral mobility and it was possible to move and flex the arm and extend it without any sensation of crepitus. The arm moved as freely as did the arm on the opposite side. It healed nicely and after ten days the after treatment was instituted. Drains were removed after four or five days. After having secured primary union, which, of course, is absolutely essential to the success of the operation, probably the most important part of the procedure is the after treatment, and I believe that to be the persistent use of passive motion. If an elbow of that kind was immobilized at any angle, I am sure even if a fascial flap had been inserted one would probably get ankylosis again, so that I believe our success in these arthroplastic operations on joints is largely dependent on the constant use of passive motion after operation. This was done after ten days and kept up with the aid of the boy, who was plucky about it, so that now, after three months, we can exhibit the result that you see. Flexion is almost complete. He can flex the arm as much as he can the one on the opposite side, and that is one of the most essential features in these cases, of which I have had three in the last year. To secure a good flexion it is more difficult than to secure complete extension which is not so essential as good flexion. Pronation and supination are quite free in this case and taken altogether I think the restored function is quite good.

DR. A. J. OCHSNER: How long after the injury was the operation done?

DR. HESSERT: The operation was done two months after injury.

DR. E. W. ANDREWS: I failed in operating on a case of this sort because in introducing the fascia I failed to do what Dr. Murphy has insisted on, namely, to include a thick layer of cellular adipose tissue. If the cellular adipose tissue is carried

along with the bony flap which we bring over the head of the bone, it produces a hygroma which strongly resembles synovial surface, which may be said to be like the serosa which moistens and secretes fluid. In all these joint cases it seems to me the technique should consist in making double rectangular flaps from the right and left sides, carried across and meeting in the middle. If this is done the flaps are better nourished and there is less danger of losing them by gangrene.

A CASE OF HYDROCEPHALUS TREATED BY CONTINUOUS DRAINAGE THROUGH A GLASS TUBE

This paper was read by DR. E. WYLLYS ANDREWS, and will appear in a later issue of SURGERY, GYNECOLOGY AND OBSTETRICS.

DISCUSSION

DR. ALLEN B. KANAVEL: I was very much interested in this case, because last June I attempted an operation upon a child, one year of age, with a congenital hydrocephalus, that was temporarily successful, but ultimately failed. Cushing has shown us the frequency of the communication between the internal and external cavities in these cases of congenital hydrocephalus, and I believe it was Payr who at one time, about two years ago, transplanted a vessel through the tissues of the brain into the internal cavities, with the idea of draining these cavities into the tissues around the skull. In this particular case I speak of there was one large vein running upon the side of the head of the child, which was sufficiently large to justify an attempt to suture it into the dura. The child was prepared and an incision made over this vessel at its bifurcation, at that point the two branches of the bifurcation were split in the middle to make a large flap. The dural flap was turned down and through a perforation this vessel was thrust, the bifurcated portion being turned back and sutured with vaselin sutures. The dura was sutured in place. For ten days after this operation the child was much better apparently. I have forgotten the amount of decrease in the size of the skull, but it was considerable. I allowed the child to go home. At the end of a week, after going home, I was summoned, and on examination of the child found that infection had occurred along the line of the sutures. This apparently did not lead to a meningitis, but at the time I saw the child, two weeks and a half after the operation, the fluid had evidently re-accumulated, and the opening into the vein had been occluded, and about a week after that the child died.

I report the case because of its suggestiveness and the possibility of some variety of auto-transplantation of vessels in these cases. The vessel was quite small, and I question the advisability of using a superficial vein in that way. It may be possible to transplant a larger vessel in a child or one from the mother, brother or sister, and do something which might be of some avail in a case of this kind

DR. CARL BECK: In the same manner as Dr. Kanavel has mentioned I tried with Dr. Carrel four years before Payr published his article to transplant a vessel in a case of hydrocephalus. The child was a year and a half old. We transplanted a superficial vein of the head into the cavity; the child died. Some time afterward, however, I tried the experiment again, and this time I resected a larger vein — the jugular vein — and transplanted it, and the result for some time was gratifying, but after about six months there was again the same symptom-complex as before.

THE CONGENITAL ORIGIN OF THE SAC IN OBLIQUE INGUINAL HERNIA

This paper by DR. WILLIAM HESSERT, appears in this issue. (See p. 252.)

DISCUSSION

DR. F. GREGORY CONNELL, of Oshkosh, Wisconsin: I am very glad to have heard Dr. Hessert's paper, which reinforces me in my opinion that practically all oblique inguinal herniæ are of congenital origin. It is very evident that the nomenclature of hernia is undergoing a change. The term "congenital" hernia is being modified and to-day applied to different conditions from that which formerly was included under this classification. The division of inguinal herniæ into direct and indirect is misleading as the direct is merely a ventral hernia through the linea semilunaris that happens to pass through the external inguinal ring and into the scrotum, it should be considered as such, and radically different from the oblique or indirect hernia in etiology, in the results, and in the line of operative treatment necessary. On the other hand, confusion arises from the fact that very old, large, extensive oblique inguinal hernia, in which the internal ring is dilated way down to the pubic arch, the conditions are practically those of a direct inguinal hernia, regardless of the origin of the neck of the sac, either above or below the deep epigastric vessels. Such extensive indirect, and all direct inguinal herniæ are practically ventral hernia, and require plastic operative procedures radically different from the early oblique inguinal hernia. And it is in the surgical judgment exercised in recognizing and meeting the indications in each individual case that success or failure is accomplished.

Perhaps some of the most important reasons for accepting this so-called "saccular" theory, as advanced by Mr. Hamilton Russell of Melbourne are: that the so-called congenital type of hernial sac, that is, in which the tunica vaginalis communicates with the hernial sac, is not the most common type met with in infants and new born babes. The hernia found most frequently in infants is the same type of hernia found most frequently in adults. The congenital type of sac is present in only about ten or eleven per cent of all cases.

On the other hand it is frequently encountered in individuals who reach adult life. They suddenly develop a hernia, which may become strangulated and is operated upon at once. In such cases this preformed sac has been present ever since birth, yet the mode of origin is similar to the type of hernia which is called acquired. In many of these cases inquiry will give a history of hernia in infancy, which was either cured by the wearing of a truss or disappeared spontaneously. Failure to discover hernia in infancy is very frequent.

Another reason why we should believe in the saccular theory is that radical cure follows operations in which nothing is done but the simple removal of the sac, that is, completing nature's work, completing the obliteration of the vaginal process and replacing anatomical structures exactly as they would have been had nature completed the development of the child, as is found in those who do not have hernia. Before operation this relationship of the structures was not sufficient to prevent hernia; after operation the same relationship of the structures cures the hernia and prevents recurrence. The only difference is that in the second case, after operation, you have removed the sac and have obliterated the vaginal process, while in the other case before the development of the hernia it is possible and very probable that there was a preformed sac in the inguinal canal communicating with the parietal peritoneum.

DR. WILLIAM FULLER: As the essayist has said, and as Dr. Connell has also stated, the greater number of inguinal herniæ are probably due to a pre-existing or congenital sac, but as to the truth on this point, some doubt may be entertained. The gross anatomy at the operating table discloses nothing in hernial operations justifying a definite opinion on the origin or nature of the hernial sac. This is a fact known to most surgeons, and pointed out by Sachs over twenty years ago.

Bramann and Weil, as quoted by Schönholzer, have made it clear that nothing but microscopic study of a hernial sac will determine its origin. They have shown that the gubernaculum, instead of becoming a useless structure at the end of fœtal life, as has been the belief, becomes in fact a very definite structure. By a process of "inversion" they describe this muscular structure as contributing to the formation of the processus vaginalis, and to the cremaster as well. According to Bramann, then, the cord and testes are covered by tissues which have their origin in the gubernaculum Hunteri, and contain, therefore, muscular tissues, a fact demonstrable only when the hernial sac is of congenital origin.

The point, after all, is of small moment, for the possession of such knowledge could add nothing to the probabilities or likelihood of a permanent cure of the hernia, nor would it even facilitate the operation.

DR. ARTHUR DEAN BEVAN: I think the conception that Dr. Hessert presented of the testicle drawing down the process of peritoneum in its development is erroneous, and it has been shown to be such. The true conception of the process of peritoneum is that it grows like a bud, or just like a tree grows when the limb bud of the lower extremity is thrown out. The mesoblast is thrown out in the lower extremity forming blood-vessels. The nerves grow into that bud.

In the same way in inguinal hernia and even in femoral hernia the process of peritoneum accompanies the vessels that pass down into the scrotum or into the limb bud, and a preformed sac is the result and is just as frequently the cause of femoral hernia as it is inguinal hernia.

Only yesterday I operated upon a boy with two congenital femoral hernias, in which it was quite evident they were distinctly congenital. Post-mortem examination has shown in a number of cases cross-sectioned these preformed sacs in the femoral and inguinal regions. I am quite of the opinion that the view which is taken by Russell and Dr. Hessert and others is correct, that the preformed sac is the most important factor in both femoral and inguinal hernias.

DR. HESSERT (closing the discussion): I believe Dr. Bevan was in error when he understood me to say that the testicle draws down the process of peritoneum. I recall an illustration of one of Russell's articles to show that there is a bud of peritoneum or a tendency of this membrane to follow along the blood-vessels in the inguinal region. The femoral and epigastric arteries with their branches form a sort of cross which roughly is the course taken by the commoner forms of femoral or oblique inguinal herniæ.

In regard to Dr. Fuller's statement as to the possibility of recognizing the sac, I think in the

majority of cases at operation one can form a pretty certain conclusion as to whether or not the sac is of congenital origin. By bearing in mind the different points mentioned in my paper, especially the occurrence of constrictions of this kind, and the coexistence of constrictions and sacculations and pockets and extra chambers, one can at once make a diagnosis that a certain sac is of congenital origin, not in all cases, but three-fourths of the cases. The frequency with which these are found, when you look for them, is astounding. In the majority of cases you will find something about the sac which will point to its being of congenital origin.

TUMOR OF THE CEREBELLUM

Presentation of the Patient

By WILLIAM R. CUBBINS, M. D.

The object in presenting this case is to emphasize some of the possibilities of improvement, but at the same time to enable us to make a prognosis that will at least carry some idea as to what may happen following operations of this kind. After the diagnosis of a cerebello-pontine angle tumor had been made by Dr. Julius Grinker a decompression operation was decided upon with the idea of removing the tumor should the condition of the patient warrant further procedure.

There was an almost complete loss of sight due to choked disc and an accompanying optic atrophy, some cerebellar ataxia, slight and irregular headaches, and only one or two slight attacks of vomiting, otherwise the patient was in fairly good condition.

During the operation considerable trouble was experienced with hæmorrhage from the bone, which was honeycombed with large sinuses, otherwise the operation was without event. The amount of bone removed is shown here in the skiagram. If you will look closely you will see that all of the occipital bone is removed below the superior curved line, from the right mastoid process over to within one inch of the left mastoid, including the posterior rim of the foramen magnum. When the dura was opened the cerebellum was forcibly extruded more markedly on the right than the left side. Patient's condition not being very good at this stage no attempt at removal of tumor was made.

The fascia was firmly closed and the skin over that. After recovering from the anæsthetic she showed marked mental confusion which continued for three or four months. The ataxia, which had been limited to the lower extremities, now involved the upper also, and there was also some external strabismus in the right eye. It was not possible to determine the amount of sight at this time as the mental confusion was so marked. Now, however, the mental condition has cleared up, and at present we have only to deal with a slightly more severe ataxia in both upper and lower extremities.

The eyesight which she had at the time of the operation is about the same, but the patient has learned how to use it better, and has little or no trouble in describing familiar objects. Unusual objects are also described more freely. There is some protrusion which contains a clear fluid, and at times there has been an escape of the cerebrospinal fluid. As a resume we can say that in order to save her eyesight we have caused her to be ataxic. The mental changes that are possible should also be forewarned against.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

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Compound Fractures of the Anterior Region of the Skull (Les fractures compliquées de la région antérieure du crâne). DR. L. THÉVENOT. *Archives générales de chirurgie*, September 25, 1909.

In discussing this subject and in reporting cases of this lesion, the author states that fractures of the anterior region of the skull are not infrequent and that many of them are compound fractures. These fractures are usually due to direct violence, and if the overlying tissues are not divided by the contusing body, they are often cut by the orbital ridges. The individual may have fallen upon his forehead, he may have been kicked by a horse, or struck with a club. These etiological factors explain why the fracture is rare in women and why it is more frequent in adults than in children.

In discussing the pathological anatomy, he says that in these cases the skull lesion may be a fissure, a comminuted fracture with or without depression. Fissures may be the only lesion present. Their length and their course are variable and depend upon the causative conditions. They may exist alone or be associated with near or distal greater disturbances of the frontal region. These greater disturbances may be fractures with or without depression of the fragments. Often the fragments are depressed by the trauma which has caused the fracture. Any portion of the frontal region can be the seat of fractures; the median region is the most frequent seat, at times, the region which corresponds to the frontal sinuses. The anterior wall of the frontal sinuses may have been injured, converting the sinuses into cavities containing blood and wound secretions.

A distinction must be made between fractures of the frontal sinus and fractures involving the entire thickness of the skull. These bony lesions are associated with lesions of the soft tissues, such as lacerations of the superior longitudinal sinus of the meninges of the cerebrum. The superior longitudinal sinus in this region is only of secondary importance. It is here poorly developed and the hæmorrhage determined by its rupture is not alarming. A clot is formed, the hæmorrhage is arrested, the walls of the sinus becoming adherent to each other for a greater or less distance, lead to its obliteration. In a few cases, blood accumulates between the dura mater and the brain, leading to the formation of subcranial hæmatoma. These are always of small volume and do not determine clinical manifestations. The dura mater is a resistant, fibrous membrane. It is easily detached from the overlying bone; this explains its integrity in many of these cases. However, cutting and sharp fragments may perforate or divide it. Such wounds of the dura mater are always limited in extent.

Lesions of the cerebral convolutions can exist with those of the dura mater. At times a contusion, a crushing of the cerebral substance takes place and a cerebral tissue mass mixed with blood escapes through the edges of the wound. Lesions of the cerebrum may exist and the meninges be intact.

The author is of the opinion that prognosis in these cases must be guarded. Other things being equal, fractures of the anterior region of the skull are the least serious of the cranial fractures. When nervous disturbances persist they are not very marked. They consist of apathy, somnolence, loss of memory, etc. The aim of the surgeons should be to prevent infection. In all cases where infection is suspected to have occurred even if the operator be dealing only with a fissured fracture, the margins of this fissure should be resected. Resection of the margins of the bone is the way to avoid the retention of wound secretions and the development of infections. All splinters of the internal table must be removed. In cases of comminuted fractures with or without displacements, intervention is imperative. The object of intervention is to avoid infection and to prevent the occurrence of cerebral compression. Though the brain is compressible, it is not so with impunity. Detached fragments of bone must be removed.

A subdural hæmatoma must be evacuated by incision of the dura. The author believes in early resection of hernia cerebri. AIMÉ PAUL HEINECK.

Operations in the Posterior Fossa of the Skull (Über Operationen in der Hinteren Schädelgrube). DR. B. BAISCH. *Beiträge zur Klinischen Chirurgie*, band 60.

Baisch reports three cases from the Heidelberg clinic, of which two were gliomas and one a cerebellar cyst. One of the gliomas should really be noted as a cysto-glioma.

As to the causation of cerebellar cysts Baisch gives the following classification:

1. Congenital anomalies. Diverticula of the fourth ventricle.
2. Accompanying solid tumors. Cysto-sarcoma, cysto-glioma.
3. Simple serous cysts.
4. Hæmorrhagic cysts (apoplexy).
5. Softening cysts (trauma, embolism).
6. Dermoid cysts.
7. Parasitic cysts (cysticercus).

The first three groups are by all means the most numerous.

Operative treatment offers a hopeful prognosis. Fourteen cases reported by Borchardt are quoted, of which thirteen recovered. A full restoration of damaged function may not always be attained, as in one of the cases reported by Baisch, in which an atrophy of the optic nerve was already present and the visual damage could not be corrected. In another case an unsteadiness in gait still remained after operation and some tendency to fall backward. In spite of this the patient's life was saved.

As to symptomatology Baisch finds headache, diminution of sight, cerebellar ataxia, choked disc, vomiting, and pressure pulse.

The incision used in the Heidelberg clinic had its base in the middle line of the back of the neck. The line of incision passed from the tip of the mastoid upward, curving inward to a point 2 cm. above the occipital protuberance and passing down on the opposite side. In this way bleeding from the sinus transversus and sinus longitudinalis may be avoided. An osteoplastic flap is recommended. The Gigli saw was used in the reported cases. The dura was opened in the form of a horseshoe flap. Baisch lays stress on the preservation of all possible brain substance.

Appended to the above report is a note of a case in which operation was done and nothing found. At autopsy two days later, atrophy of the right half of the pons, fresh hæmorrhage in the right pedunculus cerebri and in the subdural space, cerebral and cerebellar, were found. One further case is also mentioned which so improved after a Neisser-Pollock brain puncture, that no operation was made.

Of five cases, two were operated and recovered, two were operated and died, and one recovered to a sufficient degree under palliative measures that no operation was done. Cysts appear a better prognosis than other tumors. W. C. DANFORTH.

Hemostasis by Elastic Constriction of the Trunk (La Hermostasia por Constriccion Elastica del Tronco). DR. RAMON TORRES CASANOVAS. *Revista de Medicina y Cirujia*, October, 1909.

The author reports results of experiments on dogs, not having cared to attempt this method of hemostasis on human subjects.

The animals were anæsthetized with chloroform and a rubber tube applied about the body below the margin of the ribs until the femoral pulses were obliterated. Two turns of the tube were found sufficient. Compression was maintained 40 to 45 minutes. On removal the following facts were observed.

The animals regained consciousness with great rapidity accompanied by a marked acceleration of the pulse rate and fall in blood pressure. This was more pronounced when the pressure was suddenly removed.

A marked oliguria followed, in some cases the total amount of urine in the first 24 hours being only 1 cc. of concentrated urine; the amount gradually returned to normal in about four days and no abnormal constituents were found.

A paresis of the lower limbs followed, the dogs being uncertain and unsteady in their gait for several days, gradually returning to normal in five to ten days. The author believes that more or less permanent harm might follow in cases where there had been any previous affection of the legs.

In one case melena supervened after eight days and lasted two days; when it had ceased the animal was killed and autopsy showed a circular ulceration of the large bowel at the level of the constriction; as autopsies on numerous other cases failed to show any similar condition, and as there was a chronic inflammation of the large bowel in this case, the author concludes that the injury was due to the effect of the constriction on a previously altered tissue.

The author concludes that, while it may be harmless when the tissues are normal, this method of constriction may be fraught with grave dangers in cases of previously diseased tissues.

He adds that this method had been used by Dr. Ribera y Sans of Madrid for years before it was brought out by Momburg, and suggests that it should be called the Ribera-Momburg method rather than the Momburg method. B. J. O'NEILL.

A Practical Method of Obtaining the Duodenal Contents in Man. MAX EINHORN. *Medical Record*, 1910, lxxvii, 98.

Einhorn introduces a small rubber tube, on the end of which is attached a perforated metal bulb, into the stomach. Aspirates the stomach contents, then washes out the tube in situ and allows it to remain until peristaltic action carries it into the duodenum and even beyond. Its location can be determined by the measurements on the tube and by the X-ray.

C. G. GRULEE.

Etiology of Appendicitis (Zur Aetiologie der Appendicitis). MACLEAN. *Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, vol. xxi, No. 1, p. 36.

MacLean claims that an extensive meat diet is the real cause of appendicitis and that obstipation and mucous colitis are not to be considered as etiologic factors in appendicitis because all three conditions are the results of the same cause — excessive meat eating. They may occur independently of each other or concomitantly. It appears from MacLean's experience, as well as from previously recorded observations, that the simple life does not predispose to appendicitis and, in fact, people leading such a life are notably free from

this disease. He has become further convinced, as the result of observations made while stationed in China for four and one-half years, that appendicitis is really a disease of civilization. This is also true of constipation and mucous colitis, conditions with which vegetarians are never affected and which yield readily to a vegetable or meat-free diet. As further proof of his theory, MacLean cites the fact that nurslings almost never and young children rarely ever have appendicitis. Only the meat eating children have appendicitis. This theory would also explain the more frequent occurrence of appendicitis in men than in women; its appearance in certain families and certain districts.

FRED C. ZAPFFE.

The Value of Ascertaining the Coagulation-time of the Blood in Surgery (Die Verwertung der Koagulationsbestimmung des Blutes in der Chirurgie). DRS. WOLFGANG DENK AND I. HELLMAN. *Mitteilungen aus den Grenzgebieten der Medizin und Chirurgie*, vol. xx, No. 2.

In this article the methods of Hayem, Vierordt, and others are reviewed, the method of Wright and his technique which is used by the authors being given in detail.

The first series of 18 experiments are upon healthy individuals in order that an average normal coagulation-time may be arrived at; viz., about 2 minutes and 30 seconds.

The next 28 experiments are upon patients suffering from ordinary surgical diseases. The average in these is about the same — 2 minutes, 30 seconds.

In nine experiments upon patients suffering from surgical diseases which cause cachexia and marasmus, the coagulation-time was reduced to 2 minutes, or 2 minutes, 15 seconds.

Table iv gives the results of experiments upon 18 patients who habitually bled freely upon being wounded or suffered from severe nose-bleed, or bled very freely during an operation, all of these requiring a longer time to coagulate, even as long as 3 minutes, 20 seconds. Further experiments after the administration of calcium lactate show the coagulation-time reduced markedly, 40 seconds to 2 minutes, 20 seconds.

In 23 experiments after a milk diet had been given, the coagulation-time was greatly reduced but not so markedly as after the administration of calcium lactate.

Lastly are seven experiments after the administration of lemon juice. These show a constant increase in the coagulation-time as marked as was the decrease in time after the administration of calcium lactate.

The authors mention the work on serum therapy in memophilia by Lahli, Weil, Wright, and others, and point out that the administration of calcium lactate and calcium containing foods, expecially milk, will enhance the value of the serum therapy. Aside from this the authors point out the most practical results of the experiments as bearing upon thrombosis and embolism and refer to the work of Wright and Knopf regarding thrombosis in typhoid, which demonstrated an increase in calcium and increased tendency to coagulation. To avoid this tendency milk diet is dispensed with and lemon juice is given.

Résumé:

1. The Wright method and technique as described is the most accurate and applicable.

2. It is of practical value to the surgeon in diagnosing hemophilia.

3. In all bleeders, operations should be deferred if possible until a prophylactic course of serum or calcium has been given, during which the results of the treatment are controlled. All unnecessary operations should be abandoned when, after a course of prophylactic treatment, the coagulation-time remains higher than usual.

4. In the after treatment of all surgical cases having a normal or decreased coagulation-time, milk and foods hastening coagulation should be avoided. By increasing coagulation-time thrombosis and embolism are avoided, and this is done by the administration of lemon juice.

H. A. POTTS.

The Value of the Undescended Testis. JOHN BLAND-SUTTON. *The Practitioner*, 1910, lxxxiv.

Bland-Sutton calls attention to the fact that undescended testicles have never been proven to functionate except in the early years of young manhood, and he has never found spermatozoa in any removed by him. He advises removal where they interfere with an operation, e. g., herniotomy. He speaks of axial rotation and malignant growths. Of the latter he has been able to find fourteen specimens in the London pathological museums which he thinks is certainly proof of the predisposition of the undescended testicle to malignant growths.

C. G. GRULEE.

Acetone Alcohol in the Disinfection of the Operative Field. OTTO V. HERFF. *Centralblatt für Chirurgie*, December 25, 1909.

Dr. v. Herff objects to the usual method of skin closing (soap and water, alcohol, and some solution such as bichloride) on the ground that soap and water softens the skin and opens the glands, permitting the escape of bacteria, without allowing time for the removal or destruction of such bacteria. He considers alcohol our best disinfectant since it hardens and dries the skin and locks the deep lying bacteria in the glands. The action of the alcohol since it enters the deeper recesses, is continuous. The action of soap and water is thus antagonistic, and furthermore, dilutes the alcohol and diminishes its action. Some cleansing agent must then be substituted for soap and water. v. Herff considers that acetone is the best so far tried and finds that it is satisfactory, a good cleansing agent and that it aids the action of alcohol. He uses a solution of acetone alcohol āā. It is especially useful in disinfection of hairy parts.

In addition to this, as a double precaution, the skin may be painted with an alcoholic or ethereal resinous solution. This further seals up the organisms. The following solution is recommended: Benzine and Resia Damar āā 10. Ether 100. Thymol 0.5. In place of the thymol 20 per cent of a solution of iodine (7), potassium iodide (5), and alcohol (100) may be used.

The technique is as follows: The dry shaved field

is well rubbed for five minutes, with acetone alcohol. The excess is sponged off and the wound area painted with the resinous solution. After the operation the area is sponged dry and again painted with the resinous solution. v. Herff has used this method since 1907. In over 280 cases there have been but two infections, both mild, superficial affairs.

Bacteriological work on this method of disinfection has been done by Oeri and Pfisterer (Zeit. f. Geburt. u. Gyn., 1908) and Von Heck (Inst. z. Erforschung der Infectious Krankheiten. Kalle, 1909).

J. F. CHURCHILL.

Surgery of the Heart (Contribution â la chirurgie du coeur). DR. SALOMONI. *Archives générales de chirurgie*, September 25, 1909.

Some time ago the author reported 134 cases of cardiac suture. He again discusses the subject and reports a few previously unpublished cases.

To get access to the cardiac wound, he opens the intercostal space at the side of the wound by enlarging the latter with scissors, and then disarticulates from the sternum the one or two costal adjacent cartilages. He believes that this intercostal route is the most rapid, the least mutilating, and the simplest of the various methods that have been suggested. If this incision fails to give sufficient room, it can be enlarged by means of a linear osteotomy of the sternum. This transversal resection, however, he recommends only for wounds of the base of the heart or of its right cavity.

There is some discussion as to the value of pericardial drainage. According to some clinicians, drainage of the pericardial cavity provokes infection of the pericardium, of the pleura, and the formation of pericardial adhesions. It is about the same discussion as that regarding peritoneal drainage with this difference, that the pericardial serosa absorbs less than the peritoneal serosa and that intrapericardial blood accumulations are only very slightly absorbed.

Out of fifty-eight cases of suture of the heart ending in recovery, drainage was employed in thirty cases. The cases of recovery in which drainage was used, proved simply that though drainage is not indispensable in all cases, it is useful in many.

Pericardial effusion is frequent after suture of heart wounds. It most frequently accumulates posterior to the heart. Pericardial effusion determines pericardial pain, anxiety, weakness; frequent pulse and cyanosis are late symptoms.

One hundred and fifty-eight cardiorrhaphies reported by 119 operators, give fifty-nine recoveries and ninety-nine deaths. Owing to simultaneous lesion of both cavities, to lesions of the motor centers and to valvular lesions, some of the cases were irremediably fatal. Injuries of the coronary arteries are usually fatal owing to infarct, aneurisms, degeneration of the heart muscles. The ligation of a branch of the coronary artery can be followed by recovery. The coronary arteries are not terminal arteries and therefore their ligation is not contraindicated. If the heart stops beating during the cardiac suture, slight massage may start it beating again.

To make a diagnosis of a cardiac wound, we have to take into consideration the seat of the wound, the symptoms of internal hæmorrhage, the increase of cardiac dullness and oppression, of pericardial anxiety, cyanosis, rapidity of pulse. In some cases instead of a cardiac wound, a wound of the lungs is discovered.

AIMÉ PAUL HEINECK.

Opsonins in Surgery (Klinischer Beitrag zu Wright's Lehre von den Opsoninen). ERHARD SCHMIDT. *Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, vol. xxi, No. 1, p. 67.

A rather extensive series of experiments and observations, made by Schmidt, with reference to staphylococcus and tubercle bacillus infections, has convinced him that the determination of the opsonic index, as carried out at the present time, is of practically no value for therapeutic or diagnostic purposes, because it often falls short of showing actual conditions and its interpretation frequently yields questionable results. The methods in vogue at present are too complicated and too uncertain and open to too much question to make them of any or much clinical value. Furthermore, therapy cannot be employed successfully in the case of chronic inflammations, even when the index has not been determined. Therefore, too much reliance should not be placed on the determination of the opsonic index.

FRED C. ZAPFFE.

The Diagnosis and Treatment of Duodenal Ulcer. B. G. A. MOYNIHAN. *Proc. Roy. Soc. Med.*, 1910, iii, Surgical Section, 69.

In summing up the symptoms Moynihan brings out the following points. The onset is insidious with a vague feeling of discomfort in the epigastrium which comes usually at least two hours after eating. The pain comes on gradually and gradually increases, but is relieved by the ingestion of food; it may be referred to the back or to the right side. Acid eructations are frequent but vomiting is not frequent.

The attacks come on periodically and during the interval the subject feels perfectly well. Dilatation of the stomach comes late.

Moynihan says that "Recurrent severe hyperchlorhydria *is* duodenal ulcer." We rarely find an excess of acidity in the advanced cases. Hæmatemesis or melena occurred in 70 of 197 cases.

The treatment is always surgical, but it is difficult to determine when medical treatment should cease and surgical measures be resorted to. The following surgical procedures may be used: (1) excision of ulcer; (2) excision of a cylinder of duodenum and closure of the distal end, joining the pyloric end to the second portion of the duodenum; (3) partial resection; and (4) gastroenterostomy.

C. G. GRULEE.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF OBSTETRICS

UNDER THE CHARGE OF

C. S. BACON, M. D. RALPH WALDO LOBENSTINE, M. D.
HELIODOR SCHILLER, M. D. C. G. GRULEE, M. D.

The Significance of Posture in Obstetrics. A. F. A. KING. *N. Y. Med. Jour.*, 1909, xc, 1054.

King states that thigh pressure should be regarded as a third force in labor. He believes that a squatting posture with the knees against the abdomen will often materially aid a protracted labor.

In cases of transverse presentation he advises that the woman kneel on the knee of the side to which the head is directed, and that the thigh of the opposite side be against the abdomen, the foot being flat on the floor in front of the patient. He has seen several cases in which this maneuver has apparently produced "spontaneous" version.

Where the head is in the lower segment and rotation is delayed, he advises that the woman kneel and then lean back on her heels. In the normal woman the heel will press in the sacrosciatic foramen and may bring about a rotation. Slight pressure over the sacrosciatic foramen in the cadaver will produce rotation of the head.

He feels that the obstetrician should give nature more chance to help herself, and states the above advised measures are harmless.

C. G. GRULEE.

The Morphology of Montgomery's Glands (Über das Verhalten der Montgomery Drüsen). NATOMSON AND GOLDSCHMIDT. *Monat. f. Geb. u. Gyn.*, b. xxx, h. i.

The opinions with regard to the morphology of the so-called glandulæ of Montgomery or tubercules of Montgomery, vary. Some believe them to be accessory mammary glands, some sebaceous glands, and some that they are a combination of sebaceous and accessory mammary glands.

In order to decide this open question, the authors examined a great number of areola and found that in the areola are, first, sebaceous glandulæ. They vary in number and size, are found in the cutis, subcutis, in the subcutaneous, connective, and fat tissue, sometimes reaching far down to the parenchyma of the mammary gland.

The sudoriferous glands present are for the most part small, but sometimes their coils are very large and contorted. They have a large lumen, especially during pregnancy, while the size of the sebaceous glands does not depend on the functionating period of the mammary gland

In the areola there is also, besides the normal lactiferous ducts, mammary tissue. There are,

1. Accessory mammary glands, which terminate in a duct in the areola.

2. Aberrant, lactiferous ducts which terminate in the areola.

The organs which have been called accessory mammary glands have been seen by the above authors only in functionating glands. They lie in the cutis, appear in lobules, have one excretory duct which often shows a lactiferous sinus, and an excretory duct terminating in the areola. This duct, as well as the accessory ducts, may terminate in communication with the duct of a sebaceous, a sweat gland, or a hair.

If we examine an areola with a magnifying glass, we see two kinds of tubercules. The tubercles of Morgagni, in man and woman, and the tubercles which are seen only in women and especially during pregnancy, the glands of Montgomery. The former contain only a sebaceous gland, probably a hair and a sweat gland. The latter vary as to their contents. They contain either accessory mammary glands, or a combination of them with a sebaceous or sudoriferous gland, or only an accessory lactiferous duct.

The authors claim that the glands of Montgomery are not a gland tissue per se. It is natural that accessory mammary glands, also that the sweat gland, will show proliferation during pregnancy, thus the protuberance becoming more distinct. In a number of cases the authors found the above described structures with a terminating duct, but no protuberance, the cutis perfectly flat. This peculiar condition was probably produced by tension in the skin.

The authors came to the conclusion that we should give up the name glandulæ of Montgomery and use in stead tubercules of Montgomery.

According to these findings, the presence of colostrum in the areola is easily explained, coming from the accessory mammary glands. Transitional stages of sudoriferous glandulæ into mammary glands as described by Eggeling, have not been seen by the authors. HELIODOR SCHILLER.

A Case of Distocia Due to a Teratoma (Parto distocico deido a inclusion fetal). DR. J. PEDRAJA. *Siglo Medico*, 1909.

Dr. Pedraja reports the following case: Patient was a para ii of 26, of normal antecedents. Labor

took place at term and was normal until after delivery of head, when there was a delay of considerable length in delivery of the trunk, in spite of strong pains and good use of accessory muscles. The fœtus was dead and had an enormous abdomen. Autopsy showed this abdominal enlargement to be due to a tumor mass, 550 grams in weight, lying in front of the stomach and liver and attached to the junction of the stomach with the œsophagus. Section showed this mass to be a teratoma, containing cartilaginous bony, and muscular tissue, etc. B. J. O'NEILL.

Hæmorrhages from the Genital Organs in Hemophilia (Genitalblutungen bei Hæmophilie). FRAENKEL AND BÖHM. *Monats. Geb. u. Gyn.*, b. xxx, h. 4.

The general belief and the often-made statement that women do not have hemophilia, are incorrect. The author gives the histories of seven cases of hemophilia in women and was able to collect 151 more or less well described cases in the literature. We do not know the exact nature of the condition and therefore the definition can only be arbitrary.

A very copious menstrual hæmorrhage which lasts several weeks and resists all treatment, and which occurs in a person with apparently normal genital organs and with a family history of hemophilia, or at least with a tendency to copious or long lasting spontaneous hæmorrhages from other organs, must be called hemophiliac.

Case 1. A girl of fourteen with dangerously copious menstrual hæmorrhages. In the family are three members with symptoms of a hæmorrhagic diathesis.

Case 2. A girl of eighteen with a clear family history, has to be considered as a sporadic hemophiliac with a tendency to enormous menstrual and spontaneous hæmorrhages. Died during the sixth menstruation. This case proves the statement that hemophilia in women is always of bening nature to be incorrect.

Case 3. A simple case of hereditary hemophilia.

Case 4. A girl of 20. A case of sporadic congenital hemophilia with a tendency to spontaneous and traumatic hæmorrhages from the earliest childhood, and very severe menstrual hæmorrhages.

Case 5. A woman of 30. A case of sporadic hemophilia with spontaneous nasal, intestinal, and uterine hæmorrhages, aggravated after the first confinement.

Cases 6 and 7. Cases of sporadic congenital hemophilia.

Among the 151 collected cases were 99 of positive hereditary nature, 34 negative concerning heredity, 18 doubtful.

In 121 cases hæmorrhages of the genital organs occurred. Puberty begins between the tenth and fourteenth years. Twelve cases showed the first symptoms at the beginning of puberty; thirty cases had had hæmorrhages long before; nine cases menstruated normally; eighty cases menstruated too much and too often. The symptoms disappeared in many cases long before menopause, showing that menarche and menopause are independent of the disease. The menstrual hæmorrhage lasted from three to four days. In thirty-three cases it stopped after the use of heroic treatment only. In ten cases the patients died during menstruation, of acute anæmia.

Among 100 reported pregnancies and confinements are ten miscarriages with two deadly and five severe hæmorrhages. The first and second stage of labor are nearly free of hæmorrhages, not so the third; here are reported five deadly and fifty-six very severe hæmorrhages. Four cases had severe hæmorrhages on the 14th, one woman died in the 4th, one in the 8th week of hæmorrhages. Tendency to miscarriages does not exist.

If we compare the hemophilia in man, where 60 per cent of the sufferers reach the age of six and 11 per cent the age of twenty years, with the same disease in woman, we readily see that the course and prognosis in the latter is far milder and better. The ratio in women and men is given by some as 1:4, by others as 1:3. As a prophylactic measure, he demands strict prohibition of marriage.

The treatment of hæmorrhages of the genitalia in hæmophilia consists of firm packing of vagina and cervix with cotton. This might be saturated with adrenalin solution or gelatin or calcium chlorid. He advises also the subcutaneous use of styptica and serum; in desperate cases atmocausis, but he warns against currettement or extirpation of the uterus.

HELIODOR SCHILLER.

The Pathology of Eclampsia and Toxæmia of Pregnancy. J. E. WELCH. *Bulletin of the Lying-in Hospital of the City of New York*, 1909, vi, 12.

Welch reports the findings in 14 cases of eclampsia and four cases of toxæmia of pregnancy and comes to the following conclusions:

1. The liver lesions in eclampsia are not uniform. Pregnant or post-partum women dying from convulsions may have hæmorrhages, central necrosis, general autolysis, or cloudy swelling in the liver.

2. The liver lesions in toxæmia of pregnancy are not uniform. They may be either hæmorrhagic or central necroses, both of which are found in eclampsia.

3. The hæmorrhagic lesions are produced by liver and placental cell emboli, thrombi formed from blood plates and fused red blood cells and by a solution of vascular endothelium. Heightened blood pressure increases the extent of the hæmorrhages.

4. The agent producing the hæmolysis and general cell destruction is probably an enzyme.

C. G. GRULEE.

The Clinical Aspect of Placenta Prævia (Zur Klinik der Placenta Prævia). JULIUS RICHTER. *Wiener klinische Wochenschrift*, 1910, xxiii, 87.

After taking up the question of the treatment of placenta prævia as carried out in Schauta's clinic the article discusses the advisability of performing Cæsarean section in such cases. Of 11,107 labor cases at the Schauta clinic in the three years and ten months, from 1906 to 1909, there were 125 cases of placenta prævia. These are tabulated according to the location of the placenta, age of the fœtus, etc. In treatment version is preferred to the colpeurynter. For the performance of Cæsarean

section in placenta prævia to be advisable, according to Richter, three conditions must be excluded: first, the patient must not be exsanguinated; second, she must not have been examined outside the hospital; third, there must be a full-term living child. In no one of their 125 cases were these conditions all absent.

In conclusion he says: "Sectio Cæsarea classica is only indicated in placenta in those cases which are not exsanguinated, have not been examined outside the hospital, and the child is living and at full term, and with the express wish of the woman to save the child."

"In the large material at our clinic there was no single case which could have passed these indications, and we must say in the words of Schauta, 'Cæsarean section in our clinic even for the future will represent no lasting therapy.' " C. G. GRULEE.

Streptococcic Infection and Leucocytosis (Streptococcus Infection and Leucocytose). ZANGMEISTER. *Monats. f. Geb. and Gynaek.*, b. xxxi, h. 1.

The first conclusion which the author derived from a large series of blood counts was that the numeric fluctuations of the single leucocyte forms per cc. blood show the real condition of the patient, but not the numeric ratio of the variety of forms to each other. To make a prognosis in streptococcus infections from the blood picture it is important to know that conditions change completely after the first twenty-four hours after the infection and that the findings during the first twenty-four hours do not apply later on.

In monkeys he found the following after the first 24 hours after infection:

1. In infections rapidly fatal, all forms of leucocytes decline quickly in number.

2. In infections fatal after a few days, he found a tardy and small increase of the mononuclear neutrophilic cells and a decrease of the polynuclear neutrophilic and eosinophilic cells and lymphocytes in the first 18 hours.

3. In infections not fatal, he found an increase of the mononuclear neutrophilic cells during the first 6 hours after the infection; from then a decrease. The polynuclear and eosinophilic cells and lymphoctes increase in number after the first 6 hours.

Therefore good prognostic symptoms are:

a. An immediate increase of the mononuclear neutrophilic cells for the first 6 or 8 hours, with a following decline.

b. An increase of the polynuclear cells after 6 hours, after a short decline.

c. An increase of the eosinophilic cells inside the first 24 hours.

d. An increase of the lymphocytes in the first 24 hours.

The prognosis is bad (1) if the mononuclear cells show no increase or a decrease in the first 8 hours; (2) if there is a continuous decrease of the polynuclear cells and lymphocytes.

In a large series of the blood-countings before and immediately after operations the author found that these findings in monkeys are parallel to them in men.

After the first 24 hours conditions are changed, and the curve of the eosinophilic cells, of the lymphocytes, and of the mononuclear neutrophilic cells is of no importance. A continuous decrease of the polynuclear cells or their remaining stationary is a bad prognostic sign. In less severe infections they will rapidly or at least slowly increase.

His final conclusions are:

We are allowed to make a good prognosis inside the first 24 hours after the infection if we find (*a*) an immediate increase of the mononuclear neutrophilic cells with a slow decrease after 8 hours; (*b*) an increase of the polynuclear cells after 8 hours after a small decrease.

We have to deal with a fatal infection (*a*) if the mononuclear cells increase after the first 20 hours; (*b*) if the mononuclear cells do not increase at all or decrease immediately after infection; (*c*) if the polynuclear cells decrease constantly.

He made one blood count before, one 6 to 8 hours, and one 20 to 24 hours after the operation, respectively, after infection.

After 24 hours, the number of polynuclear cells only is of importance; if they are below normal and keep on decreasing the prognosis is bad, and vice versa.

By injecting a person with dead streptococci, Zangmeister was able to test the resisting power of the person against streptococcus infection — "Resisteur probe." If the resisting power is reduced the mononuclear cells after the injection will show no increase or the increase comes late; the polynuclear cells will show no increase soon after the infection, or a decrease.

HELIODOR SCHILLER.

Pyelitis in Pregnancy and Its Complications. F. E. SONDERN. *Bulletin of the Lying-in Hospital of the City of New York*, 1909, vi, 1.

Sondern bases his opinion on eighteen cases of pyelitis in pregnancy of which eleven gave symptoms of an initial cystitis and four of acute suppurative nephritis. All of his cases showed the bact. coli communis in the urine. He believes that these are cases of ascending infection. C. G. GRULEE.

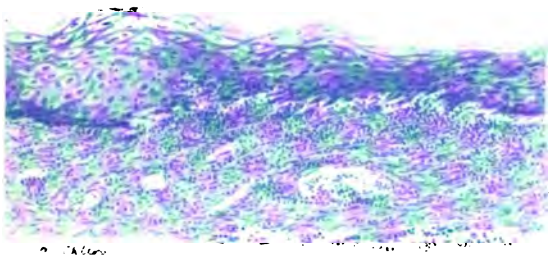

Fig. 1

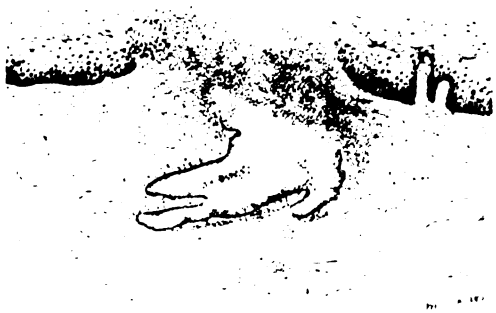

Fig. 2

Fig. 3

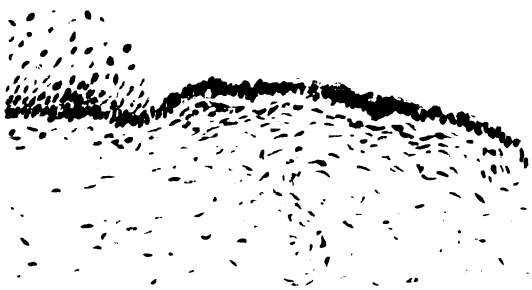

Fig. 4

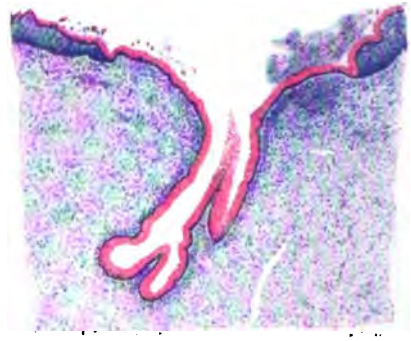

Fig. 5

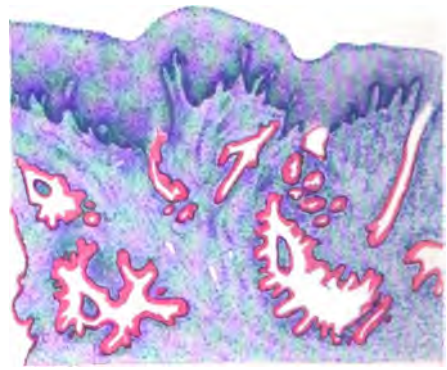

Fig. 6

Fig. 7

SURGERY, GYNECOLOGY AND OBSTETRICS

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"EROSIO" PORTIONIS VAGINALIS UTERI[1]

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IN spite of much work on this subject, there is no uniformity of ideas, as is well shown by the discussions at the Berlin Gynecological Society on the 8th of January and the 12th of February, 1909.

There are two views as to what an erosion of the portio really is. The main idea of the one is a disappearance of the upper layers and a change of the basal cells of the squamous into columnar epithelium. (Ruge and Veit.) The essence of the other is a loss of all the epithelium, which may, in the process of healing, be replaced by cylindrical cells.

There are many theories in regard to the origin of erosions, and I shall discuss briefly some of them.

The congenital origin may well come first in consideration. This theory was advanced by W. Fischel, who in his work (1879) wrote that these erosions can originate in a twofold manner.

"Either the epithelium of the surface is destroyed through external chemical or mechanical influences and the exposed mucosa becomes inflamed, or from some cause an inflammatory swelling of the mucosa precedes and leads secondarily through an extensive exudation to stretching, thinning and ultimate throwing off of the epithelium" (viii, p. 77). He wrote further: "My view as already expressed is, that in these cases it is a kind of ectropium, in the sense of a gradual change of the vaginal mucous membrane of the portio, it being gradually replaced by cells from the inflamed cervical mucous membrane" (viii, p. 90). In a later study he presents the results

Fig. 1. Obj. 3. Oc. 3. Tub. 20. Haemalaun. Diagnostic excision. An area at some distance from the erosion showing an extension of the round celled infiltration under the squamous epithelium and a death of the basal layer of cells.

Fig. 2. Obj. 3. Oc. 1. Tub. 20. Haemalaun. Uterus removed because of retroflexion with adnex-tumors and adhesions. This patient had a purulent vaginal discharge. Eversion was present and there was an "erosio glandularis" with marked round celled infiltration around the glands. The area shown is at some distance from the erosion and shows what might be interpreted as a beginning erosion caused by the inflammation and round celled infiltration excited by an infected gland.

Fig. 3. Obj. 1. Oc. 4. Tub. 15. Haemalaun. Showing two communications of a gland with the surface. Round celled infiltration though slight is present around the openings of the glands. At one of the orifices there is apparently a destruction of the basal squamous cells.

Fig. 4. Obj. DD. Oc. 3. Tub. O. Haemalaun. Drawing from an "erosio glandularis" which is healing. The basal cells are shown exposed as a form of columnar epithelium. This same preparation showed true cylindric epithelium on the surface.

Fig. 5. Obj. 3. Oc. 1. Tub. 15. Haemalaun and muci-carmine. Nullipara. Myomatous uterus. Shows the squamous epithelium growing under the cervical epithelium which shows the characteristic staining with muci-carmine.

Fig. 6. Obj. 1. Oc. 4. Tub. 16. Haemalaun and muci-carmine. Glandular cells show the characteristic staining reaction for mucin. The squamous epithelium has grown into the openings of the glands underneath their epithelium.

Fig. 7. Obj. 1. Oc. 4. Tub. 18. Haemalaun. Diagnostic excision. Squamous epithelial plug connected with the surface. Near it one sees a small cyst lined with low cylindrical epithelium.

[1] From the Laboratory of the University Gynecological Clinic of the Royal Charité Hospital at Berlin.

of his investigation of twenty-eight still-born and new-born children, among whom he found this congenital erosion in thirty-six per cent. He described his findings as follows: "The vaginal surface of the portio is covered with a mucous membrane of varying extent, running upwards from the region of the external os toward the vaginal vault; this (mucous membrane), not only on account of its single layer of columnar epithelium but also because of its less papillary structure and its possession of mucous secreting crypts and glands, must be considered as a direct continuation of the cervical mucous membrane" (ix, p. 196). It is also important to note that he says: "Where we found this surface in these new-born infants covered with squamous epithelium we saw no trace of glands of any description" (ix, p. 197).

One might ask why the above described congenital erosion may not disappear after, as well as before the birth of the child, leaving no traces of the columnar epithelium and the glandular formation.

The most essential part of his theory is presented by him in the following manner: "It must be admitted as possible that the erosions in adults are formed only when the affected individual carries over from an earlier period of development the necessary remnants for this" (ix, p. 200, Fischel).

Since portio and vagina originally had the same covering of columnar epithelium and similar glandular formations, one should find similar pictures in erosions which are not situated directly at the external os. Cases have been described in which glandular figures were seen in the vagina as well as on the portio. Such cases are however rare and can hardly be used to explain the ordinary erosion of the portio.

A second theory is that erosions are produced by acquired eversion or ectropium. (Tyler Smith in England and T. A. Emmet in the United States.) This, or a similar condition, had previously been briefly described by Roser. That cervical mucous membrane can occur upon the portio in the neighborhood of the external os cannot be denied and one can definitely say that the prolapsed and everted mucosa of the cervix corresponds anatomically with the picture described by Ruge, Veit and others as erosion.

The third much discussed theory of Ruge and Veit states that erosions originate in loco and that they do not owe their origin, at least not exclusively, to preformed glands and most important it presumes that after the loss of the upper layers of the squamous epithelium the basal layer, stimulated in some way or other, is changed into columnar epithelium, from which transformed epithelium glands are created. This constitutes the essence of the theory presented by Ruge and Veit, as is seen in the following quotation: "The glands are to be considered as arising from invaginations of this columnar epithelium and this itself from a change of the mother cells of the squamous epithelium into independent cylindric epithelium. The cervical mucosa, normal or pathological, is not really everted but the mucosa of the portio itself becomes glandular and can thus present the appearance of an eversion" (vii, p. 436). According to the same authors the final healing takes place in the reverse manner, that is, the columnar epithelium which originated from the basal layer changes itself again into squamous epithelium. The surface becomes covered and the newly formed glands are filled up with these transformed squamous epithelial cells.

A fourth class of theories called, according to the suggestion of C. Ruge, the perforation theories, was first put forward by Münzberger (1881) who writes: "Further it is not impossible that a gland grow through the portio from the inner surface of the cervix and make its appearance on the outer surface. If we examine preparations of portiones which have been amputated during pregnancy or the puerperium we shall get an idea of the growth energy of these glands. The columnar epithelium raises up the squamous epithelium and pushing itself underneath it, changes by rapid growth the form of the papillæ, and gives rise to an erosion" (ix, p. 34). Schottländer, who in part takes the standpoint of Ruge and Veit, in part that of von der Hoeven, believes he has proved that the glands perforate the squamous epithelium. He says: "I believe it to be possible for small glands lying under the basal layer of the squamous epithelium to form a

communication with it and by continual secretion form a path for an external opening. Occasionally a preceding vaginal inflammation may prepare a way for a rupture to the exterior." He thinks also that "such a preparation is not absolutely necessary, that much more a gland can, to all appearance, from active growth of its epithelium alone and at most with incidental assistance from leucocytes, make its way through the entire thickness of well preserved squamous epithelium" (iv, p. 8).

Gottschalk has written in a similar way: "That in spite of the fact that the basal layer of the squamous epithelium may remain, it never takes on the character of the cervical epithelium; however, his main idea is that the so-called erosion glands (erosio glandularis) do not arise from invaginations of the basal cylindric cell layer of the pre-existing squamous epithelium, but are in fact real cervical glands which grow from the inside of the lips outward and break through on the surface, after the squamous epithelium of the affected places has lost its power of resistance or has been cast off" (x, p. 920).

Apparently Gottschalk has put together two entirely distinct things, namely: a primary perforation through the epithelium; and an extension of columnar epithelium upon an already eroded surface.

He explains the loss of the squamous epithelium through (*a*) subepithelial hæmorrhage; (*b*) pressure by distended glands; (*c*) breaking through of glands or cysts and a substitution of outgrowing glandular epithelium for the atrophic squamous epithelium.

He believes further that the "erosio papillaris" arises in two ways, namely, through a rupture of a papillary cervical gland upon the surface of the portio and also by hyperplasia of the connective tissue cells with the formation of papillæ, which is stimulated by a marked hyperæmia and a strong growth of the limiting glandular epithelial cells.

In the discussion following Gottschalk's presentation R. Meyer emphasized the difficulty of differentiating the various stages of the erosion and ulceration. He held the theory of Ruge and Veit as not proved, remarking that erosions and ulcerations are more often observed in the stage of healing or covering over with columnar epithelium than when the epithelium is lost.

He remarked: "In all cases I hold that the loss of the squamous epithelium resulting from inflammation (infiltration and hæmorrhages in conjunction with maceration from the cervical secretion) is the essential point; only this is an erosion and the covering of the wound surface with columnar epithelium is the first stage in the healing of the erosion" (xxix).

Continuing he said that the epithelial covering can come from the margins of the erosion either on the portio or in the cervical canal, also from the eroded, preformed, inflammatory, or perforating glands. The different varieties of glands which may be present under the squamous epithelium of the portio can grow in various directions through the inflamed subepithelial tissue. The epithelium which grows out from the glands replaces the lost squamous epithelium of the surface, and constitutes the first stage of healing. The "erosio glandularis" and "papillaris" he considers as an excessive regeneration or hyperregeneration. R. Meyer remarked that he considered the superficial columnar epithelium as newly formed and not as autochthonous, as Ruge believes. The complete healing results when the cylindrical epithelium of the surface of the erosion as well as of the glands is supplanted by squamous epithelium growing in from the margins of the erosion.

C. Ruge in the discussion held to his theory and emphasized the idea that erosions originate in loco and that there is no relation between the cervix and the erosions of the portio.

In considering these different theories and studying the preparations some things have been impressed upon me, so before taking up the description of my findings in detail, I wish to call attention to a few points. One can hardly deny that there are erosions without an epithelial covering, and it would seem the simplest and best to consider this as the essence of "erosio portionis."

It is absolutely necessary for one to keep in mind that broadly speaking three stages can be recognized in erosions, namely, the beginning, the developed, and the healing; these three stages may occur in an erosion simul-

taneously. As one considers the theory of the origin of these erosions and sees a large number of specimens he is convinced that no one narrow theory explains them all.

The congenital remnants which Fischel found in thirty-six per cent and Dieterlen in only ten per cent of new-born children have nothing to do with the loss of the squamous epithelium, nor do they account for the round celled infiltration. It is perfectly possible to account for the presence of some of the glands under the squamous epithelium by the active growth of the cervical glands which extend deeply into the tissue even into the muscle of the cervix. The simple erosion has no glands and its origin can hardly be attributed to fœtal remnants.

Nor is it possible to explain all of the erosions as eversions for one sees erosions with no eversion present and eversions without any trace of an erosion. This theory explains neither the simple nor papillary erosion though it is perfectly reasonable to think that glands and cysts can be brought to the outer surface of the portio by an eversion of the lips. It seems fair to state that eversion and ectropium do not signify erosion but that they are often associated with and can in all probability be a factor in the formation of an erosion.

It seems that the theory of Ruge and Veit is not sufficient explanation for all the ordinary cases because the erosion as understood by them can be an erosion in process of healing, and it is important to note, that upon the surface two kinds of columnar epithelium occur, namely, those cells which come from the cervical epithelium and glands, and the other cells which are evidently left over from the basal layer of the squamous epithelium. These cells have an entirely different appearance from the cervical epithelial cells and very important to note is the fact that these two classes of cells have an entirely different staining reaction with muci-carmine. These different characteristics will be considered later in detail. Further, it is not established that the glands can originate from the transformed cells of the Rete Malpighii; they might be preformed or as we shall see they could be formed from cervical epithelium. And it is not proven that healing results from a change of the cylindric epithelium into squamous epithelium for it might be displaced and supplanted by the latter.

The perforation theory is not held as a sufficient explanation for all erosions even by its advocates. Schottländer speaks as does von der Hoeven of a continual struggle between the squamous and the columnar epithelium. It is rather to be viewed as a fight between the squamous epithelium and inflammatory processes. The cylindric epithelium which may cover the erosion will be supplanted by squamous cells as soon as the inflammation subsides. Squamous epithelium is never overcome by cylindrical epithelium but is destroyed by the inflammatory process.

It is not to be considered as a two-sided struggle between the two kinds of epithelial cells and one can at most speak of a one-sided struggle of the squamous epithelium against the columnar epithelium and never the reverse.

That the ordinary erosion arises from pressure by or breaking through of the glands or cysts, is difficult to prove and in my opinion explains the origin of very few erosions.

At the suggestion of Prof. R. Meyer I undertook the examination in serial sections of preparation from portiones in 57 cases. Among these there were eight specimens from pregnant uteri of the second to the fifth month and one from a puerperal uterus.

In five cases the entire portio and in the others a piece of tissue from one or both lips in the neighborhood of the external os, was sectioned and studied; in the portiones from pregnant uteri, as well as in some others, both lips were observed side by side.

Aside from the specimens obtained during pregnancy and the puerperium the series comprises six diagnostic excisions, five normal, ten abnormal portiones without erosion and twenty-seven with erosion.

The age of the patients varied from a new-born babe to a woman of 60 years. Of these thirty-five had either borne children or aborted, and in nineteen it is not stated; this leaves three in whom no pregnancy had taken place. Eleven complained of leucorrhœa, one had had gonorrhœa, and in the others no history of either was given.

The following outline will give a general

idea of the causes for removal in the various cases:

1. The diagnostic excisions were removed to decide a suspicion of malignancy.

2. The pregnant uteri were extirpated because of pulmonary tuberculosis.

3. The puerperal uterus was taken out because it was ruptured.

4. The others were removed on account of elongatio colli, prolapsus, myomata, inflammation and other diseases of the tubes and ovaries, endometritis, and metritis.

It seems advisable to consider briefly the findings in the pregnant uteri separately.

In these specimens from puerperal and pregnant uteri seven showed erosions, one had a healed erosion, and another presented none. Eversion was found six times in these preparations, twice without erosion.

It is seen that no entirely normal portio was found among these. The seven cases with erosions presented larger or smaller areas without the natural epithelial covering and showed a more or less intense superficial round celled infiltration especially marked under the newly formed squamous epithelium and the eroded surfaces. In three cases there was a striking infiltration near the glands and at times a larger or smaller number of round cells was seen under the old squamous epithelium.

Erosion glands (those in direct relation to the eroded surfaces) were found in seven portiones but only three times were they distended; in seven cases glands were demonstrable under the old squamous epithelium; distended glands or cysts were found in various locations eight times.

Single layered columnar epithelium on the surface had in no case any evident connection with the basal squamous layer but in three instances there was a single layered cylindric epithelium on the surface which had a direct connection with the glands.

The epithelium of the erosion glands often shows degeneration and apparently they are often destroyed during the inflammatory process.

Concerning the healing there is not much to be said, however, I found granulation tissue three times, newly formed squamous epithelium growing out from the edges of the erosion in four cases, and saw very often squamous epithelium growing into the glands underneath their epithelium, and indeed in one case the squamous cells were evidently growing into the cervical canal itself and raising the columnar epithelium in its own domain.

I wish to mention as especially important the differences in form and staining, especially with muci-carmine, between the cells of the basal layer of the squamous epithelium and those of the real columnar or cervical epithelium. These differences will be described in detail under another heading (Fig. 5, 6).

From the observation of these preparations one sees:

1. That erosions occur very frequently during pregnancy.

2. Certain things concerning the origin of erosions:

(*a*) Inflammation is constantly present and the infiltration shows itself often under the well preserved epithelium at some distance from and apparently independent of the erosion itself. One finds also necrotic squamous epithelium on the surface. These findings indicate that inflammation and infiltration may occur under the squamous epithelium before the surface is eroded (Fig. 1).

(*b*) The frequency of marked infiltration around the glands and their orifices indicates that the inflammation can originate in and spread from them (Fig. 2).

(*c*) The infiltration is often independent of the glands (Fig. 1).

(*d*) Glands are almost constantly present in erosions which are located near the external os but one is not justified in saying that erosions originate from pressure of these glands which do not always show distension.

(*e*) It is possible that occasional erosions originate from ectropium.

(*f*) The glands show very great growth during pregnancy.

(*g*) There are no proofs for the origin of erosions from casting off of the epithelial cells and laying bare the basal layer of the squamous epithelium.

3. That healing of the surface takes place by a growth of the squamous cells from the margins of the erosion.

It is to be noted further in regard to the

process of healing that the single layered columnar epithelium which occurs on the surface of the portio is nearly always true cervical or glandular epithelium.

That the squamous epithelium often overcomes the true columnar epithelium is evident from the manner in which it grows under and raises up the latter from the underlying connective tissue. One sees this very plainly in the sections stained with muci-carmine, in which the red stained mucin-cells are seen lying on the squamous epithelium of the surface as well as on that which has grown into the glands themselves (Fig. 5). In no case did I see mucin-cells under well preserved squamous epithelium but occasionally the columnar epithelium, was seen growing out from the glands upon the eroded surface which was partially covered with dead squamous epithelium which no longer had any connection with the underlying connective tissue. An apparent destruction of the squamous by a growth of the columnar epithelium underneath it was found in none of the cases. It appears that the cylindric epithelium takes possession of only those surfaces which are already eroded.

Granulation tissue has an important part to play in the healing of erosions and ulcerations.

The erosion glands disappear partly from necrosis during the inflammatory process and those which are left may disappear from the ingrowth of squamous cells which converts them into solid plugs of squamous epithelium or into cysts lined with squamous cells; these may later become flattened out even with the surface of the portio (Fig. 7).

The six *diagnostic excisions* showed various stages in the development and healing of erosions. In only one of these was carcinoma found. In all the others there were areas without an epithelial covering and in two there was ulceration present. There was old squamous epithelium present in all but in only one was there any newly formed squamous epithelium and in one other true columnar epithelium occurred on the surface.

In all of these specimens there was a diffuse or a localized round celled infiltration but in none of them was it particularly marked near the glands. It is however quite important to note that there was infiltration between the cells of the old squamous epithelium.

In two of the cases there were no glands in the eroded area or under the squamous epithelium and in the others there were no distended glands found in connection with the erosion. In two cases poorly preserved squamous epithelium was recognizable on the surface and in one the basal layer was the first to die. This in my opinion points to a primary cause operating under the squamous epithelium and not to a change of the character of the epithelium, neither to eversion nor casting off of the superficial epithelial layers as the essential causes of erosions.

One might further conclude that inflammation and round celled infiltration play the principal part in the origin of erosions.

From these preparations one is certainly not justified in concluding that the erosions were caused by pressure from distended or perforating glands, and evidently the congenital factor is not essential to the development of an erosion.

From the remaining preparations I will first describe briefly five apparently normal portiones.

One specimen showed a very small area of round celled infiltration under the well preserved squamous epithelium; there were no glands present near this infiltrated area. In two cases there were no glands or cysts present under the squamous epithelium; in another case the cervical canal near the external os was covered with squamous epithelium in which the glands opened; in another a cyst without an external opening was present under the epithelium of the portio, and in the fifth there were both glands and cysts present. In all of these cases the glands lay under the squamous epithelium close to the external os and in only one instance had they grown deeply into the tissue of the cervix.

For the sake of comparison with the processes on the portio I studied a piece of tissue from a prolapsed vagina and found an area with the basal layer of the vaginal mucous membrane exposed; there was no infiltration present nor were any glandular formations found; neither had the cells of the basal layer taken on any of the characteristics of the true columnar epithelium.

Of the ten cases without erosions there were six with eversion. Two specimens, one with an eversion, showed apparently healed erosions. In two others, there were very small areas which appeared to be very early stages in the development of an erosion.

In the remaining twenty-seven cases all of which had erosions there were twenty which showed eversion. These erosions were located at the external os except in two instances, when they were at some distance from it and showed neither glandular formations nor true columnar epithelium on the surface. There was a complete loss of the surface epithelium in only one case, all of the others showing larger or smaller areas which were denuded of their epithelium.

Newly formed squamous epithelium was growing from the margins over the erosion in thirteen and six of these showed low columnar epithelial cells on the surface which were in connection with the basal layer of the squamous epithelium. This kind of superficial cylindric epithelium never shows any direct connection with the glands, has a form differing decidedly from that of the cervical epithelium, and distinguishes itself from the latter by not staining with muci-carmine.

In fifteen instances true columnar epithelium extended from the glands or cervical canal upon the surface.

The following distinguishing characteristics between the real columnar epithelium and that originating from the mother cells in the basal layer of the squamous epithelium have been noted. The real cervical epithelium stains constantly with muci-carmine while the basal cylindric epithelium does not show this reaction (Fig. 5, 6). The former is always in connection with the glands or the epithelium of the cervical canal but the latter is independent of both glands and cervical epithelium and usually shows a connection with the squamous cells. It is rare for the cervical epithelium to show a tendency to form more than one layer but the basal epithelium has a quite constant and marked inclination to build several layers. The first is much more regular in the size, form, and arrangement of its cells than the latter. The cells of the real columnar epithelium are much larger, have relatively smaller, thinner, and more roundish nuclei than the cells of the basal epithelium and the nuclei are located more noticeably toward the base of the cells in the first than in the second form (Fig. 4, 5).

Infiltration is constantly present in the eroded area; in sixteen of the specimens it was very marked around the glands and especially at their openings in the squamous epithelium; the round cells are often numerous under the newly formed squamous epithelium and the infiltration quite frequently spreads out under the old squamous epithelium. Usually the infiltration is only superficial but in a few of the preparations it extended quite deeply into the tissue. Two of the cases showed small isolated erosions on the portio which appeared to have very recently broken through the squamous epithelium. In one of these the infiltration was around a gland but in the other it was entirely independent of any glandular formation.

In the two erosions which were isolated on the portio at some distance from the external os there were no glands nor was there any true columnar epithelium on the surface. These observations seem quite important when considering the various theories regarding the origin of erosions as both of these were apparently of inflammatory origin.

In the rest of the cases glands or cysts were almost constantly present; it is however well to note in this connection that these erosions occurred near the external os. I saw atrophy of the epithelium, with apparent erosion formation, from pressure of an enlarged and distended Nabothian follicle, only once.

Twelve of the cases with erosion glands showed distended and fifteen undistended glands. In a few cases cysts or ectatic glands with two and in one case with three communications with the surface, were found; this of course indicates that they can form new connections with the surface or that two or more glands can grow together. Both of these possibilities seem to me about equally probable (Fig. 3).

In all of the cases with erosions there were glands under the squamous epithelium and only seven of them showed no distended glands or cysts. They occur more frequently under the newly formed squamous epithelium in which they open more frequently than in the

old. This tends to show that as the epithelium becomes older the glandular openings disappear, and that the underlying glands diminish in number. Another fact which points strongly to this conclusion is, that one often sees relics of former openings and quite frequently real communications with the surface. In this same connection it may be mentioned that distended glands occur more frequently under the old than under the new squamous epithelium, although one sees cysts in the cervical canal itself. The glands lying under the old squamous epithelium may be undistended or unequally distended, forming cysts of varying sizes. It is not uncommon to find cysts lined with squamous epithelium and occasionally one sees solid plugs filled with these cells. The squamous epithelial cysts sometimes have a content which stains with muci-carmine. This fact points to the conclusion that they were previously lined with mucin-producing cells. The columnar and low epithelial cells of the ordinary cysts always stain with muci-carmine but the squamous cells never take this stain properly.

It occurs quite frequently that glands grow out from the region of the external os sometimes to quite a distance under the portio epithelium and more or less parallel to its surface. This is, of course, important in connection with the perforation theories but is also of great importance in explaining the occurrence of glands under the squamous epithelium of the portio.

Newly formed squamous epithelium was found only twice in the cases without erosion; the surface of the others was completely covered with old squamous epithelium. In this connection it may be well to describe the differences between the new and the old squamous epithelium. The papillæ of the new are less marked and not so regular as those of the old epithelium. The cells appear more delicate and do not stain as strongly in the former as in the latter. The new basal cells appear larger and not so regularly arranged as the old ones. The cells of the outer layers have relatively larger, more uniformly round bodies than the older ones, which become markedly flattened especially nearer the surface.

Five of the nine specimens without active erosions showed round celled infiltration and in four of these it was most marked around the glands. This is important to note because it points to the glands as harborers of a latent infection which may flare up and produce an erosion (Fig. 2). Two of four preparations with healed erosions presented small infiltrated areas which were breaking through the squamous epithelium. Glands were found under the squamous epithelium in all of these cases; they were often distended even to cyst formation and showed both real and relics of former openings in the squamous epithelium. Glands opening through the squamous epithelium were found near the external os in the portiones removed from a young child and a girl. These facts point of course to a persistence of glands under the squamous epithelium as emphasized by Fischel and could account for the presence of at least some of the glands which characterize the so-called "erosio glandularis."

After a brief consideration of the various possibilities in connection with the questions arising from a study of this problem I shall endeavor to draw a few conclusions from the material that has been investigated by me during the past year.

In regard to the causation of these erosions one has to consider the congenital erosion or ectropium as described by W. Fischel.

Further one must mention the mechanical injuries which may arise from operations, etc., from abortions or labors; it must not be forgotten that these injuries may cause subsequent eversion and it is also important to remember that in inflammatory conditions with marked swelling of the cervical mucosa and especially in the softening of the tissues and shortening of the cervix incident to pregnancy there may be a more or less marked prolapse of the cervical mucous membrane. As a mechanical factor, may be mentioned the atrophy of the epithelium caused by pressure from distended glands or cysts.

Chemical causes may operate on the portio through the use of douches or direct application, also by the maceration of the epithelium by a normal or pathological cervical secretion.

As an all important cause must be considered the inflammation which may result from an infection arising in some way or other.

It is necessary to seek for an explanation of the findings which occur on the surface. In reference to the eroded areas one may say that it is possible for them to arise from abrasion, including maceration, from pressure atrophy, and from the death of the epithelium due to some inflammatory process or other. The presence of the columnar epithelium may be accounted for in various ways, namely: a persistence of the columnar cells on the portio in the neighborhood of the external os; a prolapse or eversion of the cervical mucosa so that it comes to lie on the outer or vaginal surface of the cervix; an outgrowth of cells over a denuded area from the glands or cervical canal; a change of the basal cells of the squamous epithelium into real columnar epithelium; naturally these basal cells might persist as a kind of low cylindric epithelium. The question of the source of the newly formed squamous epithelium may be answered in various ways. It is possible that it might come from a change of these basal columnar cells into squamous epithelium or as a growth from indifferent mother cells; it is not at all difficult to think of them as coming from islands of squamous epithelium which have remained undestroyed on the surface or around the openings of glands; lastly, no one would doubt the possibility of their coming from the margins of the erosion which are lined with squamous cells.

Round celled infiltration is unmistakably present in nearly all of the cases and the main questions to decide with reference to it are whether it originated, primarily, before or after the loss of the superficial epithelium and where it started. It might extend from the surface inward or it might originate under the surface epithelium in the glands or in the blood or lymph vessels.

The explanation of the origin of the glands in erosions has caused a great deal of strife and the following possibilities have been considered: Preformed or congenital glands (Fischel); invaginations of the surface columnar epithelium whether the true or basal form (Ruge. Veit); the overgrowth or outgrowth of cervical glands under the epithelium of the portio (Münzberger, Schottländer, Gottschalk and others); the carrying outward of cervical structures by misplacement and eversion as a result of cervical tears and from prolapse of the cervical tissue, (Smith, Emmet and others).

A papillary erosion might originate from an excessive growth of the connective tissue, from a too strong proliferation of the columnar epithelium, or from a breaking through upon the surface of a markedly papillary gland.

Some of the possibilities in connection with the process of healing have been touched upon and will be only mentioned under this heading. One must consider granulation tissue as a factor in the ultimate healing of some of these erosions and ulcerations; the occurrence of the basal and true columnar epithelium on the surface has already been discussed as one of the most important and most disputed questions in the entirepr oblem. The occurrence and possible origin of squamous epithelium from remaining islands of cells, from a change in the character of the epithelium, from mother cells, and from the margins of the erosion has been touched upon. For the perfect ultimate healing it is necessary that the glands under the portio epithelium disappear completely. One can conceive of this as happening in various ways. The glandular cells may disappear from a necrosis due to the inflammation. Squamous epithelium may grow into the glands and throw off the columnar cells and fill up the lumen more or less completely. The cysts which are lined with squamous epithelium might originate in this way or the cells might come from a change in the character of the columnar epithelium which usually lines the cysts; it is of course possible that the squamous cells might originate from indifferent mother cells.

It is rather difficult to draw definite and exact conclusions in such a study as this as any opinions must, to a certain extent at least, have more or less of a personal equation in that conclusions are in reality only impressions created by the observation of the specimens studied. I have tried to eliminate impressions and any bias as much as possible in this matter.

1. Pregnancy seems to be a very important factor in the development of erosions because they occur so frequently in that condition.

2. The labor with its attendant injuries gives a splendid chance for infection and the development of an erosion.

3. Inflammation is the most important factor in the origin as well as the extension of the erosion; all of the other things are accessory. Round celled infiltration precedes the formation of an erosion as is proved by the following observations: such infiltration occurs in cases without erosions under the squamous epithelium either superficially or around the glands; infiltration is found under well preserved epithelium in healing and healed erosions and one sees an apparent recurrence of an erosion beginning at the infiltrated area. There are many other facts to be noted in this connection. It is important to remember that glands are especially susceptible to infection and certainly the intensity and frequency of the infiltration around their orifices is very striking, therefore one recognizes the glands as especially important for the origin and extension of the infection under the superficial epithelium. Infiltration occurs independently of the glands so they cannot be regarded as the exclusive source of the infection. The inflammatory origin of these erosions is suggested by the observation that the younger erosions show the most marked infiltration. As an important proof of the extension of erosions by inflammation must be mentioned the fact that infiltration and necrosis spread out under the old squamous epithelium and that such epithelium when it is undermined by this infiltration dies and is cast off.

4. The basal layer of the squamous epithelium appears to be the first of the epithelial layers to die as a result of the underlying inflammation (Fig. 1). This points quite definitely to a cause working under the epithelium, and while many other factors may enter into the formation of an erosion this one certainly cannot be ignored.

5. Hæmorrhages under the epithelium are often associated with the inflammatory process and this raises it from its supporting tissue and helps in throwing it off.

6. There are two distinct kinds of columnar epithelium which may occur on the surface. One is the basal columnar epithelium and the other is the real or cervical type of epithelium. They have nothing to do with each other so far as origin or ultimate fate is concerned.

7. The newly formed squamous epithelium extends outward from the margins of the erosion over the denuded surface. It is perfectly reasonable to expect that it might come from epithelial islands or from mother cells, but I was not able to find proof of this.

8. The glands under the squamous epithelium and under the erosion originate from various sources. They may come from glands which were normally present in the individual which includes those of congenital origin. The outgrowth of glands under the squamous epithelium of the portio accounts for some of them; this is especially noticeable in the softened tissue of the pregnant uterus or in that softened by inflammation. The altered relations of tissue brought about by eversion and cervical tears bring glands to the vaginal surface of the cervix. I was entirely unable to find any proof for the formation of glands by invaginations of the surface covered with columnar epithelium either of the cervical or the basal type.

9. Cysts arise from the shutting off of outgrowing glands or from a stopping of their openings with squamous epithelium.

10. In one case I saw papillary outgrowths from the surface which were partially covered with columnar epithelium. In another case I saw a marked papillary growth in the lumen of a gland but it had not broken through to the surface. My very limited observation of this form of erosions which is called the "erosio papillaris" points to their origin and development from a hyperregeneration primarily of the connective tissue.

11. The process of healing is accomplished by the growth of granulation tissue. It is noticeable that, irrespective of its type, epithelium has a tendency to cover over a denuded surface and it is because of this power that we find the erosion covered with the most accessible form of epithelium. This would very frequently be columnar epithelium because of the nearness of the glands and the cervical mucosa to erosions which are most commonly found near the external os. It appears also that the cylindric epithelium has the power of growing more rapidly than the squamous

epithelium. On the other hand the squamous epithelium has greater powers of resistance, and growth though slower is more persistent. It is in this way that the surface ultimately becomes covered with the squamous cells.

12. The glands disappear in various ways and first may be mentioned the necrosis which occurs during the inflammatory process. The growing in of the squamous cells and destruction of the glandular cells is proved by the frequent occurrence of newly formed squamous cells under the cylindrical cells at the mouth of the glands (Fig. 5, 6) also by the occurrence of older glands with columnar epithelium on only one side while the rest of the lumen is almost completely filled with squamous cells. One sees solid plugs of squamous epithelium which show more or less intact communications with the surface (Fig. 7) and the occurrence of the squamous epithelial cysts is not at all infrequent.

Finally I wish to state that erosions are chiefly inflammatory processes showing pictures which vary with the stimulus to their formation, and the reaction of the tissue. The congenital or acquired peculiarities of a healthy though anatomically not entirely normal portio may modify the appearance of an erosion very much. The complete and ultimate healing results when the glands are filled up with squamous epithelium and become smoothed out even with the surface which is covered by squamous cells originating from the mother cells already present on or near the erosion.

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SOME EXPERIMENTS ON OMENTAL ADHESIONS

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INTRODUCTION

EXPERIMENTAL investigation has dealt with the absorptive, adhesive, and exudative properties of the omentum, with its vascularizing functions, and with the microscopic changes in the organ in its altered states. But no detailed study of the microscopic alterations of the adherent omentum has been made. At operations, on the autopsy table, and in experiments the omentum has been found adherent in every part of the abdomen. Thus Adami,[1] in a large series of post-mortem observations, found adhesions of omentum to the various abdominal viscera were remarkably common. Eccles[2] pointed out that, in pathological conditions, the omentum, and especially its lower border is apt to be found near the seat of inflammation. In searching the literature, we have been unable to find any mention of the especial parts of the omentum concerned in the formation of adhesions.

About two years ago one of us began to observe the adhesions of the omentum to be seen at the operating table. Since then omental adhesions, fresh and old, have been observed in every quadrant of the abdomen. *Old* adhesions were seen extending to viscera, hernial sacs, and laparotomy scars. In most instances these occurred in the form of broad or narrow projections that were, apparently, prolongations of the lower, free border of the omentum. We can not recall any case in which the anterior or posterior surfaces of the omentum were involved to the exclusion of the free border. In the early stages of acute inflammatory disease *fresh* adhesions of the free edge of the omentum were seen; in later stages, however, the omental surfaces as well as the lower border were often broadly adherent to inflammatory foci. As observations on the operating table are necessarily very incomplete, we decided to perform some experiments on the omentum of rabbits in order to attempt to ascertain the roles played by different portions of that organ in adhesion formation.

[1] Adami. Canadian Practitioner, March, 1898.

[2] Eccles. St. Bartholomew Hospital Reports, 1894, xxx, p. 81.

ANATOMY

The healthy rabbit's omentum is a very delicate membrane that springs from the greater curvature of the stomach and the first half-inch of the duodenum and is situated in front of the large and small intestines. Unlike the human omentum, the layers of peritoneum do not enclose the transverse colon. On the left side they entirely envelop the spleen, which is a true intra-omental organ. The extreme portion is derived from the duodenum and is deeply seated. The whole omentum is comparatively short, and as it is attached for the greater part of its origin to the stomach—a somewhat fixed organ—it is relatively limited in its possible field of excursion. Thus it is impossible to draw the omentum into the lower third of the abdomen. The omentum may be said to have an anterior and a posterior surface (the rabbit in the dorsal position), a left and a right border, and a lower border. The latter will be designated the "edge." We will employ the term "edge" to include the immediately contiguous surfaces of the omentum. It is very thin and is often delicately scalloped. The left border, descending from the cardia, is not well defined. Inasmuch as the edge gradually approaches the duodenum from left to right, the right border of the omentum is very short The amount of fat situated between the layers of the omentum varies considerably, but is usually slight. The only macroscopical blood-vessels usually present are those in the splenic region. Occasionally a few are scattered throughout other parts of the srgan.

TECHNIQUE

The technique of our experiments was very simple. The laparotomies were painlessly

performed under local anæsthesia.[1] Careful aseptic precautions were observed, wet sterile gloves being worn. The abdominal contents were handled as little as possible. When portions of the omentum were to be resected, the organ was spread lightly over the gloved finger and sections were excised with small sharp scissors. Vessels had to be clamped in only a few instances. The cut portions of the edge could always be recognized at subsequent examinations by a delicately beaded line of blood clot. The average length of the abdominal incision was four centimeters. The incisions were always closed in layers. Most of the rabbits were subjected to a single laparotomy; in some cases, however, successive laparotomies were performed in order to observe progressive changes in the omentum. Immediately after the operation, the rabbits hopped about in lively fashion and showed no signs of shock or pain.

The results of our investigations are given below; they were arrived at by often repeated experiments, but we shall cite only a few characteristic ones:

EXPERIMENTS WITH INTACT OMENTUM UNDER ASEPTIC CONDITIONS

A. Foreign bodies were implanted in different portions of the abdomen. When foreign bodies such as lead shot were merely dropped into the abdomen, they promptly fell into the pelvis. For example:

Experiment 1. March 8th: Median hypogastric incision. With the guidance of the finger small lead shot was placed directly over the left kidney. Another shot dropped into the right side of the abdomen. *Examination*, March 10th: Lead shots adherent to each other, covered by exudate, and lying free in bottom of pelvis. Small portion of omentum edge adherent to space between two sutures at upper angle of wound. Portion adherent drawn out in form of tongue; deeply congested, and firmly attached.

We ascertained that the rabbit's omentum would not become adherent to foreign bodies in the lowest third of the abdomen, thus:

Experiment 2. March 15th: Median suprapubic incision. In front of bladder small shot was sutured to parietal peritoneum on one side of the incision, similarly a small plate on the other side. *Examination*, March 17th: Bladder greatly distended. Prevesical fat adherent to foreign bodies. Omentum normal.

In various experiments aseptic foreign bodies were sutured: to the parietal peritoneum of the left and right half of abdomen as high as the under surface of the diaphragm and as low as a short distance above the bladder level. As illustrative cases:

Experiment 3. March 12th: Median epigastric incision. Small perforated plate sutured to parietal peritoneum 3 cm. to left of incision. *Examination*, March 13th: Omental edge adherent, 1, to laparotomy wound; 2, to a small peritoneal defect (probably made in suturing peritoneum) to the right of the incision; 3, to the plate. A part of the left half of the edge was the only part of the omentum adherent. Each adhesion deeply congested and thickened. Plate entirely surrounded; through perforation in its center a delicate prolongation of omentum passed along the suture that fixed the plate to the abdominal wall and followed the suture to parietal peritoneum. The portion of edge adherent to laparotomy wound sent tiny tongues of omentum through several of the interspaces between peritoneal sutures, to become adherent to the fasciæ. Omentum taut between stomach and abdominal wall. Stomach rotated forwards 90 degrees to accommodate omental adhesions at this high level.

Experiment 4. March 24th: Median incision midway between sternum and pubis. Small button sutured against parietal peritoneum 5 cm. to right of incision (by carrying thread through the whole abdominal wall on a long straight needle). *Examination*, March 25th: From right half of edge tongue-like protrusion about 4 cm. long, surrounded, and was firmly adherent to button. Was intensely congested and thickened. Stomach markedly rotated to the right.

Experiment 5. March 29th: Incision in right hypochondrium. Liver punctured with a small hook; wound oozed freely. *Examination*, March 30th: Omentum adherent to incision by prolongation of right half of its edge. Several tongues dissected between sutures. Same congestion and thickening of adherent parts as above. Marked rotation of the stomach to right. No free blood in peritoneal cavity; was all found in the form of small clots in and near the omental edge.

Experiment 6. March 17th: Incision in right hypochondrium, starting at costal margin. Small lead plate suspended from under surface of diaphragm by short thread; latter fixed to diaphragm by a Michel clamp. *Examination*, March 19th: Broad tongue from right half of the edge firmly adherent to and surrounding plate. Small part of the edge adherent to upper angle of incision. Omental surface in broad contact with anterior and superior surfaces of liver but nowhere adherent. Marked forward rotation of stomach. Congestion and thickening of adherent portions of omentum as in previous experiments.

[1] For this purpose 1 cc. of 1 per cent solution of cocaine was employed. In rare cases there was evidence of pain, when the local was promptly supplemented by general anæsthesia. We had frequent opportunity to observe that, as Meltzer and Kast have shown, the injected cocaine apparently acts as a general as well as a local analgesic.

In all of the cases in this group of experiments the omentum became adherent. In every case the adhesions extended from its edge and from this alone. The adhesions were tongues or prolongations of the edge, varying in length and width according to the distance and size of the foreign body. In every experiment the adhesion was deeply congested — numerous vessels running in the long axis of the adhesion being seen where none had been visible before. The vascularity of the adherent portions gave them a deep red color that sharply differentiated them from the surrounding pale gray omentum.

In this group of experiments we frequently observed the remarkable tendency of the omental edge to attach itself to raw areas, no matter how small, to work its way through the smallest gaps (as those between the peritoneal sutures and those made by the needle in suturing the peritoneum), and to pass through the finest holes in the foreign bodies.

B. The omental edge became adherent to denudations of visceral or parietal peritoneum in the same manner. No matter how small the area denuded, a congested prolongation of the edge became adherent to it. In no case was any other part of the omentum attached. A striking example:

Experiment 7. March 26th: Median epigastric incision. Small bits of parietal peritoneum removed at three points: 1, 4 cm. to right of incision; 2, 3 cm. to left of upper angle of incision; 3, 4 cm. to left of lower angle. *Examination*, March 27th: Middle portion of edge adherent by four prolongations, three to the denuded area, the fourth to the laparatomy. From the latter several offshoots passed through the layers of the abdominal wall, between the sutures. The adhesions to the peritoneal denudations resembled those to foreign bodies — the same vascularization, thickening of attached portion, tongue-like shape, etc. Stomach rotated forward 90 degrees. No adhesions; the omental edge between the four points of attachment, although the edge between the adhesions was in contact with parietal peritoneum.

C. Whenever the omentum becomes adherent to foreign bodies or to peritoneal denudations, the adhesion is only by a varying portion of the edge, as indicated above. The remainder of the edge is ready to adhere to new foreign bodies or to new raw areas. This was seen in a number of experiments in which second laparotomies were performed several days after the first.

D. If several denudations are made, or foreign bodies are implanted far apart, the omental edge becomes adherent to them and not to the interspaces. Experiment 7 will serve as an illustration.

E. Although our experiments do not deal with the absorptive qualities of the omentum, we may mention that, in a number of experiments associated with intra-abdominal hæmorrhage, blood clots were only found in or near the omental edge (as an example see experiment 5).

F. When the omental edge becomes attached to points well beyond the normal site of the organ, the stomach follows its excursion. In some of the cases the stomach was rotated as much as 90 degrees on its horizontal, and 60 degrees on its vertical axis. The rotation on the horizontal axis was especially marked when the the omentum traveled in a direction opposite to that of gravity to become attached, as to the under surface of the diaphragm.

G. It has already been shown that the rabbit's omentum has one physical limitation — it cannot stretch into the pelvis. A further limitation is present when the omentum is so fixed by an adhesion of a part of its edge that the remainder cannot reach a foreign body, raw area, etc. The latter, under such circumstances, become covered by a fibrinous exudate. To illustrate the observations summarized in sections *F* and *G:*

Experiment 8. March 22d: Mid-abdominal incision. Button sutured to parietal peritoneum to left of incision. Omentum not seen during operation. *Examination*, March 23d: Button adherent to parietal peritoneum by thick fibrinous exudate. Omentum not seen. Stomach rotated backward at least 90 degrees. On lifting stomach omentum seen adherent to foreign body lying behind and above lesser curvature — adhesion of broad, highly vascularized portion of the edge which evidently drew the remainder of the omentum along. The omentum is in intimate contact with, but not adherent to, posterior surface of stomach. Foreign body proved to be a small coprolith escaped from descending colon. (In the rabbit the lower colon begins in a curve behind the lesser curvature of the stomach, and coproliths sometimes escape from this portion of the intestine.)

H. The omental adhesions covered ***all*** peritoneal defects as well as all foreign bodies

within reach. We have seen many illustrations of this statement,—some of the above described experiments will serve as examples.

I. When the edge adheres to a foreign body, the latter is completely encapsulated by this portion of omentum. Such encapsulation occurred in every experiment.

J. Congestion of the adherent part of the edge was seen in every case. Usually there were numerous fine vessels running the length of the adherent tongue, generally along its borders.

K. The omental edge never became adherent by a macroscopically visible exudate. To peel free the adherent edge more effort was required than in separating the ordinary adhesions — as those between loops of intestine and those of omental surfaces (see below) — forming in one to three days.

L. This series of experiments demonstrated an additional point: the part of the omental edge which becomes adherent is that nearest the foreign body or peritoneal denudation.

EXPERIMENTS WITH RESECTED OMENTUM

A. Inasmuch as the edge plays such a very important part in aseptic omental adhesions, the first series of experiments in this group dealt with resection of portions of the edge.

If a portion of the edge is removed and a foreign body is implanted, adhesions will extend to the foreign body from the intact part of the edge and not from the excised portion. This was demonstrated by a number of experiments. For example:

Experiment 9. April 1st: Mid-abdominal incision. Narrow strip of the left three-fourths of the edge removed in one piece. Slight bleeding. Abdominal wall closed in layers. *Examination*, April 3d: Long delicate adhesion to upper angle of wound. Came from right (uncut) part of edge. Remainder of latter not adherent, not rolled up.

Experiment 10. April 12th: Incision in right hypochondrium. Left and middle third of edge resected in one piece. *Examination*, April 16th: Median incision. Right (uncut) part of edge broadly adherent to the length of the first incision. Button then attached to parietal peritoneum 3 cm. to left of median incision. *Examination*, April 20th: Button plastered against parietal peritoneum by exudate. No adhesion to it. Part of edge adherent to first incision very firmly attached. Cut edge showed no tendency to become adherent.

B. Even when large portions of the edge are excised, leaving only small isolated areas of intact edge, the latter alone become adherent to foreign bodies or to denuded areas. As an example:

Experiment 11. May 21st: Median epigastric incision. Two long strips of edge resected, leaving three small areas of intact edge — one in the median line and two at the extreme right and left portions. Two small denudations of parietal peritoneum made 3 cm. on either side of the abdominal incision. *Examination*, May 24th: Long, narrow adhesion to right denudation from extreme right (uncut) part of edge. Delicate adhesion from central (uncut) portion of edge to laparotomy wound. Left denudation covered by exudate. The adhesion of same nature as those above described. No adhesion of the cut portions of the omentum. Stomach rotated forward nearly 90 degrees.

C. In a number of experiments conditions were made very favorable for adhesions from the excised part of the edge, as in this experiment:

Experiment 12. April 5th: Median epigastric incision. Narrow strip of the left seven-eighths of the edge removed in one piece. A button suspended from the abdominal wall by a half-inch thread attached to the left of the incision. This enabled the omentum in the region of the cut edge to come in intimate contact with the button when the animal assumed its normal posture. Peritoneum on the colon, to right of incision, pinched with forceps. *Examination*, April 7th: Button and suture are held in contact with parietal peritoneum by a fibrinous exudate. Long narrow adhesion from right (uncut) part of edge to small area of large intestine. No other adhesions.

In not a single experiment did the omentum adhere by its denuded parts; in every instance it was the intact portion of the edge (and only this portion of the omentum) that became adherent.

D. In order to avoid the trauma incident to resection of a portion of the edge, the latter was excluded by carefully coating it with a thin layer of sterile collodion. The results were the same, thus:

Experiment 13. April 29th: Incision in left hypochondrium. Omentum drawn out and edge carefully painted with thin layer of collodion from left to right as far as the edge was accessible. Button suspended by a short thread from the abdominal wall 3 cm. to the left of the incision. Examination, May 3d: Button free. No adhesion from collodionized edge. Very long thin adhesion coming from the extreme right portion of the edge was adherent to the incision.

E. The blood supply to the omental edge was partially cut off by the ligation of several vessels passing to it from the stomach. This had no effect on the formation of adhesions by the omental edge.

F. The blood, lymph, and nerve supply to the omental edge were in large part cut off in this experiment:

Experiment 14. April 21st: Median epigastric incision. A large "window" was made in the omentum by excising an area extending from the right border to the spleen and from a short distance below the stomach to 1 cm. above the edge. The edge was thus completely detached except at two points — one near the right border and one near the spleen. Button attached to parietal peritoneum to left of incision. *Examination*, April 23d: Edge adherent to button and to upper part of abdominal incision by separate prolongations of same nature as the adhesions previously seen. Loop of intestine adherent to lower part of incision.

Their exclusion had no effect on the formation of adhesions by the edge.

G. The entire omental edge, as far as accessible, was excised in a number of experiments. (It has been pointed out that the extreme right portion of the edge is almost always inaccessible without considerable trauma.) In none of the cases did the cut margin become adherent; but very often an adhesion extended from the far right (intact) part of the edge. In none of the cases did other parts of the omentum become adherent.

H. To completely exclude the omental edge it was entirely coated with collodion. The results were the same as those of group *G.*

In all of these experiments the condition of the omentum was examined from one to four days after operation. Inasmuch as we believed that the cut omental edge, like any raw peritoneal area, might become adherent after a longer period, we performed some experiments of the following nature:

Experiment 15. May 21st: Median epigastric incision. Strip of the edge completely removed. Abdominal wall carefully closed — peritoneum by everting suture (see below). *Examination*, June 2d: Through incision to the left of the first; omentum not adherent. A button sutured to one side of the incision. *Examination*, June 4th: Button adherent to parietal peritoneum by exudate. Omentum not adherent.

In five experiments of this group the omentum was examined from twelve to fifteen days after operation. In three cases (of which the above quoted is one) there were no adhesions; in two cases the cut edge was adherent in whole or in part. In the latter the adhesions were attached to the nearest loops of intestine (which were not knowingly abraded or wounded). The following experiment was performed in the case in which the omentum was only partly adherent:

Experiment 16. September 20th: Edge completely resected. *Examination*, October 5th: Cut margin firmly adherent at two points — upper part of incision and loop of large intestine. Each adhesion was about 1.5 cm. wide. Between the two adhesions a large central part of the cut edge was not adherent. Button sutured to parietal peritoneum so that, with the animal in normal posture, the non-adherent part would be near it. *Examination*, October 8th: No adhesion to button.

To summarize the results: The raw omental margin may become adherent a certain length of time (probably a week) after excision of the edge. Such adhesions occur independently of peritoneal denudations or foreign bodies. In the cases in which the raw margin did not become adherent, it did not adhere to a foreign body implanted in favorable situations. The omental surfaces did not show adhesive qualities for fifteen days after the edge was removed.[1]

THE OMENTUM IN INFLAMMATORY CONDITIONS

All of the former experiments were performed under aseptic precautions. In a few cases, however, infection occurred, and we then had the opportunity of observing the behavior of the omentum under such circumstances. The omental edge (when present in these cases) adhered to the diseased area, and the adjoining surface of the omentum was spread over and was adherent to the focus by a visible exudate. As an instance:

Experiment 17. May 7th: Left epigastric incision, traversing a milk duct. Omental edge collodionized. Small denudation of parietal peritoneum to left of incision. *Examination*, May 10th, through a median wound. No adhesion of omentum. Collodionized edge resected. *Examination*, May 17th: Pus oozing from wound. Purulent exudate in wound bulging into peritoneal cavity. Anterior omental surface down

[1] The work on this group of experiments is incomplete because nearly all the rabbits became emaciated and somewhat apathetic from five to eight days after removal of the edge. Whether this was accidental or in some way associated with removal of the edge we cannot say. The post-mortem findings did not indicate any cause for the changed condition of the animals.

to and including the edge broadly adherent to bulging mass by a thick fibrino-purulent exudate. Part of the omentum was plastered over and adherent to neighboring loops of intestine in same way.

When a mild form of infection was experimentally induced, the omental edge alone became adherent to the diseased area:

Experiment 18. September 23d: Mid-abdominal incision. A large end-vessel in the transverse mesocolon was divided between ligatures, and transverse colon was freed from mesocolon for 2 cm. The isolated intestine became collapsed and flabby. *Examination*, September 25th: The diseased piece of intestine was intensely infiltrated, œdematous, partly imbedded in a thick exudate. Opposite the mesenteric border a very deeply congested prolongation of the omental edge was attached. When the adhesion was freed a serosal defect on the colon remained. No other omental adhesions.

When, however, a severe infection was induced, the omental surface became broadly attached by a thick exudate. This occurred even when the edge was excised, thus:

Experiment 19. October 2d: Five centimeters of transverse colon freed by same procedure as that employed in previous experiment. Then a strip of omental edge removed from left border to the right as far as accessible. *Examination*, October 4th: Partly necrotic intestine surrounded by an inflammatory exudate to which the surfaces of the omentum were broadly adherent. Cut edge indistinguishable in the mass of omentum and exudate.

A PERITONEAL SUTURE BASED ON OBSERVATION OF OMENTAL ADHESIONS

Attention has been called to the remarkable tendency of the omentum to become attached to the smallest peritoneal denudation, and to work its way through the smallest peritoneal gap. The great frequency of omental adhesions at the site of a laparotomy scar — often the cause of severe pain, gastric symptoms, intestinal obstruction, etc., — has given rise to numerous attempts at their prevention. These have included applications of oil, mucilage, thiosinamine, etc., which have been for the most part unsuccessful.

Early in our experimental work we observed the frequency with which the omental edge became attached to the gaps between the peritoneal suture and even to the perforations of the parietal peritoneum made by the small needle employed. Later we attempted to obviate these complicating adhesions by more carefully applied sutures, but were only partly successful. Adhesions although fewer in number, still appeared in most of the cases.

The following method of peritoneal suture, on the Czerny-Lembert principle, was therefore employed: Beginning at one angle of the wound a half-curved needle is introduced in the axis of the wound a short distance below the cut margin of the peritoneum. The needle grasps peritoneum (and transversalis fascia) broadly. It is similarly passed beneath the opposite margin of peritoneum and the suture is tied. This everts the margins of the peritoneum and makes a broad apposition between peritoneal surfaces. The suture is passed down the length of the incision in the same way. The result is that the cut margins of the peritoneum (and transversalis fascia) are turned outwards and a broad approximation of peritoneum to peritoneum is obtained. In none of the six laparotomies in which we used this method did the omentum become adherent to the incision. We found the technique easy of application and the suture of considerable strength — it did not tear out when the animal strained (as occasionally happened in the ordinary method). Furthermore, there was no possibility of wounding viscera with the point of the needle.

RECENT ADVANCES IN THE TREATMENT OF NEPHROLITHIASIS[1]

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THE marked improvement in the operative treatment of renal and ureteral calculi is, in no small measure, to be ascribed to the general employment of more refined methods of diagnosis. The divisions of the main subject of renal calculi in which the writer has been particularly interested during the past few years are (1) the value of radiography in the diagnosis of renal calculi; (2) the frequency of occurrence of bilateral calculi and their relation to calculous anuria; (3) the importance of the newer work in the surgical anatomy of the kidney; (4) the choice of operation for removal of renal calculus, i. e., pyelotomy or nephrotomy.

1. *Value of radiography.* A few years ago one would be inclined to consider Kümmell's dictum, "no shadow, no stone," as too radical. The percentage of positive results (i. e., shadow present and calculus found at operation) is so large at the present time that such a statement does not seem an exaggerated one. The only exceptions to such an apparently dogmatic statement are the pure uric acid stones which either give very faint or no shadows.

In order to obtain such a large percentage of positive results, certain conditions are essential. First, the radiograph must be taken by one who has had a large experience in this special field. Radiography of the urinary organs has made rapid strides since the introduction of the Albers Schönberg compression apparatus. Although equally good pictures are obtained by some very expert radiographers without such an apparatus, still far more uniformly accurate pictures have been secured through its more general employment.

It is beyond the scope of this article to discuss the technique of taking such pictures further than to state that we employ the compression apparatus in all of our work.

Second, both kidneys and both ureters should be included in every picture. It is our routine practice at the Michael Reese Hospital to take a first picture covering both kidneys and the upper portion of each ureter, and a second picture, which includes both lower ureters and the bladder. The importance of such a bilateral exposure is referred to later.

In a good picture one can distinctly see the position, the outline, and the number of calculi. When the kidney is in its normal position, the stone shadows lie between the eleventh rib and a line drawn through the transverse lumbar vertebra. In a kidney which lies lower than normal the shadows will be found in a corresponding relation to such a dystopic position.

A kidney radiograph is best examined when dry and placed in a "diagnostic box." The use of an opera glass or powerful lens will be found of great service. A long twelfth rib (Fig. 2) may hide a stone shadow unless the plate is carefully studied. A calculus lying at the outlet of the renal pelvis usually has a nipple-like projection, which is so characteristic that when found opposite the transverse process of the first or second lumbar vertebra one can readily remove it through an incision into the pelvis, provided no other stone shadows are present.

Stones in the parenchyma usually have small, round, or oval shadows. When calculi lie in dilated calyces or in hydro- or pyonephrotic cavities, the shadows are quite large and oval.

When the shadow is triangular or branched, one can diagnose a large calculus occupying a greatly dilated pelvis. If a number of widely scattered shadows are seen, extensive destruction of the kidney has usually taken place. The majority of calculi belong to the mixed types and cast shadows of equal intensity sufficiently deep to be readily detected.

Third, the patient should be thoroughly purged and kept upon a diet of tea and broth for eighteen hours prior to the taking of a kidney or ureteral picture. In this manner one can exclude shadows due to scybala or other

[1] Read at the annual meeting of the Western Surgical and Gynecological Association at Omaha, December 20, 1909.

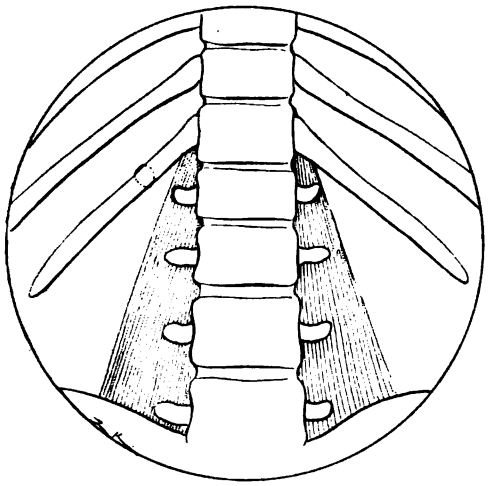


Fig. 1. Diagrammatic view of area to be covered by a skiagraph of both kidneys and upper portion of the ureters. The circle behind the twelfth rib shows the shadow of a calculus lying in front of this rib.

foreign matter in the bowels. In addition to the latter, one must differentiate shadows due to kidney calculi from those cast by calcified retroperitoneal and mesenteric glands, centers of ossification in the costal cartilages, and caseous tuberculous foci in the kidney. These can be excluded by one experienced in the interpretation of such radiographs.

2. *Bilateral calculi.* Unfortunately, but few statistics exist which are of value in determining the relative frequency of the simultaneous presence of calculi in both kidneys or both ureters. That such a condition occurs far more often than was formerly believed is shown by the fact that in a recent paper by Kümmell, of Hamburg, reporting 101 cases of renal calculi, they were present on both sides of sixteen patients, i. e., nearly sixteen per cent. In his book on Renal Surgery, published in 1901, Israel states that renal calculi occur upon both sides in twenty-seven per cent of his cases. I have been unable to find any more recent statement of Israel's experience in this direction. Kapsammer found bilateral calculi in five out of a total of twenty-eight cases of nephrolithiasis operated upon in von Frisch's clinic. He also found that in 73 cases of nephrolithiasis, examined during autopsies in the Pathological Institute of the General Hospital at Vienna, the calculi occurred in both kidneys in twenty-two cases, i. e., thirty per cent. The latter figure corresponds with the estimate of Watson, based upon 231 cases of renal calculi reported by Legueu, Albarran, Israel, Morris, and Kümmell. Watson found that the number of cases in which the calculi existed bilaterally, was thirty per cent. I have been able to collect twenty-six cases from recent literature. To this number can be added three occurring in the Michael Reese Hospital during the past year, in patients of Dr. L. L. McArthur, Dr. Braunwarth, and the writer, making a total of twenty-nine cases (Fig. 13).

Reference has been made in the section of X-rays technique to the necessity of including both kidneys in the radiograph. In many of these cases of bilateral calculi the pain is either constantly unilateral or shifts from one side to the other in a most confusing manner.

It is not only in order to avoid the reproach from the patient of having neglected to examine both kidneys for calculi that the surgeon must be informed as to the unilateral or bilateral presence of the calculi, but the danger of sudden anuria is far greater in bilateral than in unilateral nephrolithiasis.

Anuria occurred in six of Kümmell's fourteen cases, and four of these died, showing the gravity of the prognosis in bilateral cases. One of Watson's cases died of anuria, and in one of Cabot's two cases anuria appeared upon the eighteenth day after the first nephrotomy. Such an anuria is usually due either to the sudden bilateral closure of both ureters or to the obstruction of one ureter, with reflex anuria of the opposite kidney. It is the writer's belief that many cases of calculous anuria will in the future be found to be due to the former cause (bilateral calculous obstruction) than to the second-named cause (unilateral obstruction with reflex anuria of opposite kidney).

3. *Recent advances in the surgical anatomy of the kidney.* As the number of operations performed upon the urinary organs increases, it becomes more and more important for the surgeon to be familiar with every new detail in the anatomy of these structures. Those which require special mention in connection with the surgical treatment of renal calculi are (1) abnormalities of form and development and position of the kidney; (2) abnormalities of the vessels, pelvis, and ureters.

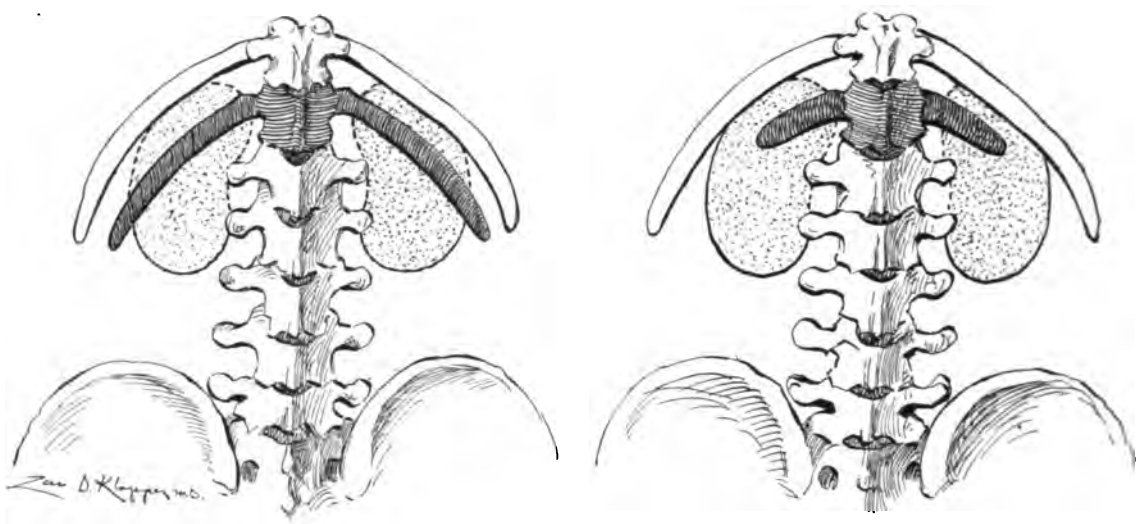


Fig 2. Long and short twelfth ribs.

Under the head of the former are included: (*a*) Solitary kidney, i. e., only one kidney is present; (*b*) horseshoe or fused kidney; (*c*) lack of development of one kidney, or hypoplasia. An excellent example of the importance of recognizing a hypoplasia is shown in Fig. 3, and was described in a recent paper by the writer. (*d*) Dystopia, or congenital displacement of the kidney. Such organs are either at the level of the sacroiliac joint or in the pelvis. Fig. 4 shows a radiograph of calculi in such a dystopic kidney.

Other anatomical points to be borne in mind in connection with operative work upon the kidney are anomalies of the renal arteries, i. e., accessory arteries and variation in the types of renal pelves.

Accessory renal arteries. The importance of the knowledge of the existence of more than one renal artery arising from the aorta cannot be overestimated. In compressing the pedicle of the kidney to check hæmorrhage during a nephrotomy for the removal of renal calculi or in ligating the pedicle during a nephrectomy one can easily overlook an accessory artery. Bleeding from such a vessel may prove very annoying during a nephrotomy or it may be torn off and a serious, if not fatal, post-operative hæmorrhage result. After ligating the main renal vessels during nephrectomy, ignorance of the presence of accessory arteries may in a similar manner cause serious hæmorrhage.

Practically no reference is made to this important anatomical point in books on anatomy or surgery, although Israel and some other writers mention cases of almost fatal post-operative hæmorrhage from this cause. The statement in the majority of books on anatomy is that a single renal artery arises from each side of the aorta to supply the corresponding kidney, dividing at or within the hilum into several branches. (Fig. 5.)

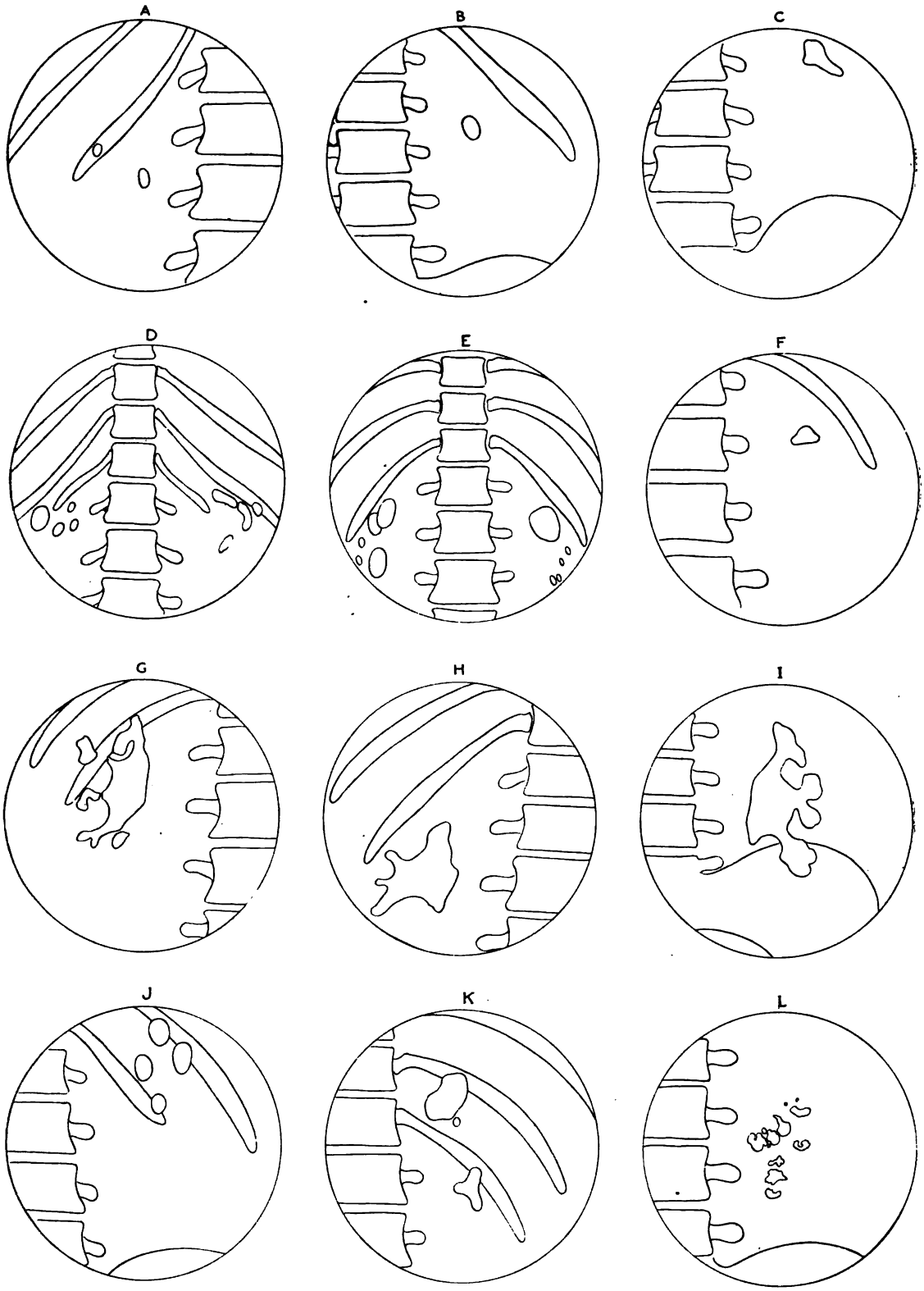
My associate, Dr. D. C. Strauss and the writer have recently begun the observation of the frequency of such anomalies in a large number of cadavers, but the work is not sufficiently advanced to permit of a report at the present time.

The most recent article upon these accessory arteries is by a Russian surgeon, Seldowitsch. In an examination of 150 cadavers, he found an abnormal number of renal arteries in 43, i. e., 30.5 per cent.

There may be either two or three renal arteries arising from the aorta. The double renal artery was present twenty-eight times on the left and twenty-five times upon the right side.

The manner of distribution of the accessory arteries to the kidney is shown in Figs. 6 to 9 inclusive, some of which were taken from our specimens.

(*a*) One artery to hilum and the other to the upper pole. (*b*) One to upper angle of hilum



Figs. 3 and 4. Tracings of renal skiagraphs. A, calculus shadow at outlet of pelvis and a second lying behind the twelfth rib. B and C, calculi lying at outlet of pelvis. D and E, bilateral calculi. F, nipple-like projection of calculus lying at pelvic outlet. G and H, coral-like calculi filling entire pelvis of kidney. I, coral-like calculus lying in dystocic kidney (just above crest of ileum). J, K, and L, multiple calculi lying in pyonephrotic kidneys. I am indebted to Drs. Greensfelder, Braunwarth, Reichman, McArthur, and Kahlke for permission to reproduce several of the tracings.

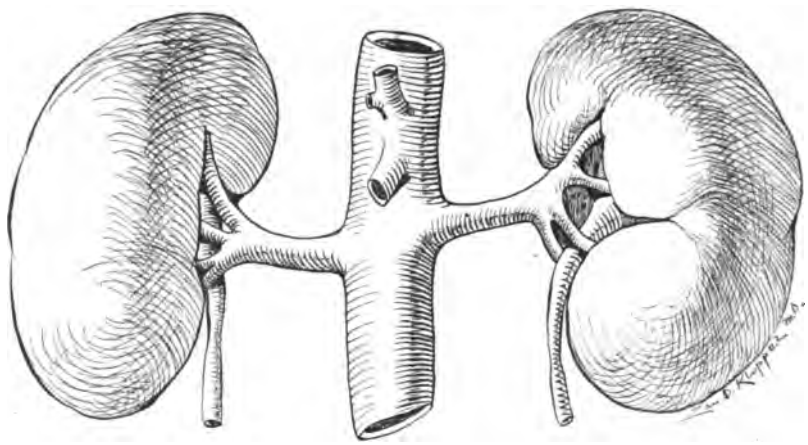


Fig. 5. Normal renal arteries. A single trunk arises from aorta and divides close to hilum. Note retropelvic branch upon left side.

and the other to center of hilum. (*c*) One to lower angle of hilum and the other to the center of hilum. (*d*) One to lower pole and the other to hilum. (*e*) One from aorta and the other from the iliac artery. (*f*) Three separate renal arteries arise from the aorta upon each side.

These accessory vessels may arise from all parts of the abdominal aorta, or even from the iliac arteries.

In nephrotomy one has most to fear from accessory arteries passing from the aorta to the upper or lower pole. To avoid these one should incise the poles as little as possible.

In nephrectomy it is always advisable to look for an accessory artery before ligating the pedicle.

After nephrectomy such an accessory artery passing to one of the poles may be torn off and serious hæmorrhage occur before the source is discovered.

A knowledge of the presence and relative frequency of these accessory arteries will be found to be of considerable importance to the surgeon.

Types of renal pelvis. The impression that only one type of pelvis exists is erroneous. This is also of great importance to the surgeon in connection with the operation of pyelotomy for the removal of calculi in the renal pelvis.

There are, in general, two types of pelves: (*a*) The classical ampullary type, i. e., a large sac occupying the entire hilum without division into large primary tubes. It is a wide sac from which a number of short primary tubes (or calyces) are given off, into each of which the apex of a renal cone or papilla opens to permit the urine to escape into the pelvis of the kidney. In such a type of pelvis, which occurs in about 30 per cent of cases (Delbet and Mocquot), a calculus can be easily found through either a pyelotomy or nephrotomy incision. (*b*) The ramifying type of pelvis. This is the more frequent form and the different varieties are shown in Fig. 12. The most common form is the bifid, i. e., the ureter expands, as soon as the kidney hilum is reached, into the pelvis of the kidney. This is relatively small and divides into two or three large primary calyces, i. e., the bifid or trifid type of pelvis. In the case of more frequent bifid type, one large tube leaves the pelvis at an oblique angle and receives the urine from the upper half of the kidney, through a number of secondary tubes or calyces proper, while the other tube runs transversely and after dividing into a number of secondary tubes or calyces receives the urine from the lower half of the kidney. In the trifid pelvis (Fig. 12) the three primary calyces receive the urine from the upper, middle, and lower thirds respectively. The importance of these recent anatomical investigations lies in the fact that in some cases it is necessary to combine a nephrotomy with a pyelotomy, in order to find a calculus. It is superflous to add that after dilatation of the pelvis or destruction of the pa-

renchyma from the presence of calculi, such pelvic relations are of no value.

If the radiograph shows more than one calculus, or if one wishes to be absolutely sure not to overlook a calculus hidden in the parenchyma or in a dilated calyx, a nephrotomy, laying the kidney wide open after the manner of an autopsy, is the only safe method. The incision is usually made a little behind the midline of the convexity of the kidney.

Relations of vessels to pelvis. A knowledge of the relations of the renal vessels is essential in the performance of a pyelotomy, i. e., opening the pelvis to extract a calculus. The renal artery and vein lie on the anterior aspect of the pelvis. Both divide into branches at this point and from the artery a retropelvic branch arises, which arches across the upper border of the pelvis, to pass across it to the kidney proper (Fig. 11). By making an incision into the posterior aspect of the pelvis one can avoid all vessels except the relatively small retropelvic artery, hence this side is the one to be chosen for pyelotomy.

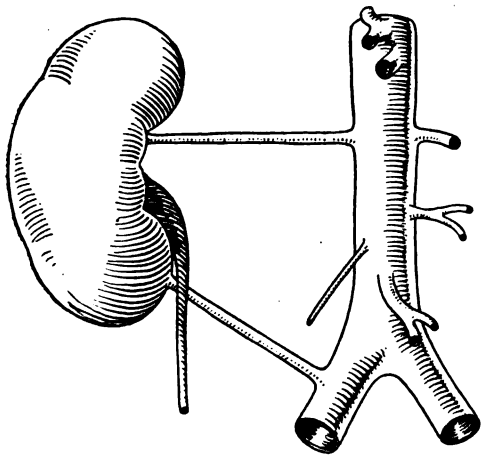
Effects of compression of renal vessels on the kidney parenchyma. Dr. D. C. Strauss and the writer are at present making a series of experiments upon animals to determine the effect of compression of the renal vessels upon the parenchyma of the kidney, such as is made during nephrotomy for renal calculi. The results of the microscopical examinations will be published in a later paper, but so far we have found that marked macroscopic changes follow compression, lasting over half an hour.

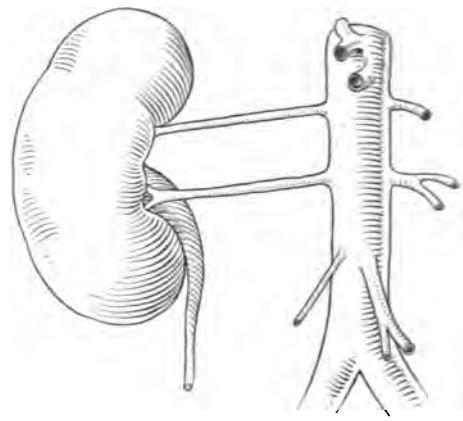
4. *Choice of operation.* The questions which confront the surgeon after the diagnosis of renal calculi has been confirmed by a radiograph are: Can a conservative operation, i. e., nephrotomy or pyelotomy, be performed, or should the entire kidney containing the calculi be removed? These two questions can only be answered by a consideration of certain preliminary data, which every operator must possess. The first requisite is that one must know the working capacity of each kidney, obtained through the use of the ureteral catheter and the most reliable tests of the functional capacity of a kidney. It is beyond the scope of this article to describe the technical steps of these tests, and it will suffice to say that, although the various procedures, cryoscopy, use of indigocarmine and of phloridzin, were at first regarded as almost infallible by the advocates of the individual tests, we have now reached the stage where most reliance is to be placed upon the chemical and microscopical examination of the urine obtained separately from each kidney, taken in conjunction with the indigocarmine and phloridzin. The latter two can only be regarded as of relative value, since it has been found by recent observers that the phloridzin test can prove negative in perfectly healthy kidneys as well as in unilateral disease. On the other hand, it can be positive when both kidneys are diseased; hence one cannot draw any conclusions from the negative results as to the pure functions of the kidneys, nor conclude anything regarding the healthy condition from the positive results. A kidney whose parenchyma is to a great extent destroyed does not excrete any sugar. In unilateral diseased kidneys, if the phloridzin test is at all positive, the diseased kidney excretes a less amount of sugar than the healthy one.

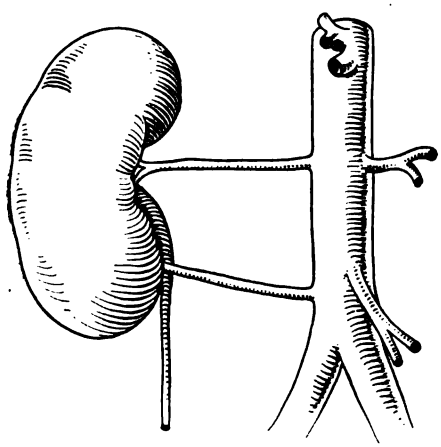
The only absolutely safe method would be to expose both kidneys before performing a nephrectomy, but even then one cannot rely upon palpation to determine whether a kidney will functionate. But few surgeons have as yet the courage to do this, so that we must depend upon the urinary examination and phloridzin tests for the present.

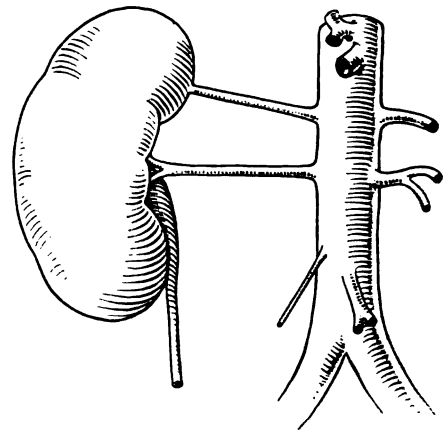
The second requisite is to know whether to choose extraction of the calculus through an incision through the posterior aspect of the pelvis (pyelotomy), or to enter the pelvis through an incision through the convexity of the parenchyma (nephrotomy).

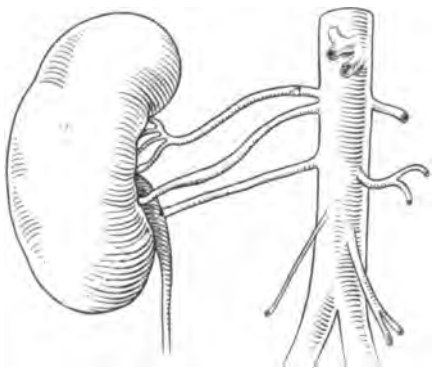
Whether pyelotomy or nephrotomy shall be performed depends upon (*a*) the condition of the urine and of the kidney, (*b*) upon the location of the calculus, and (*c*) the type of pelvis. Nephrotomy is always indicated in infected cases, when the urine contains pus or is ammoniacal, or there are gross pathological conditions in the kidneys, such as pyelonephritis or pyonephrosis. Pyelotomy can only be considered in aseptic kidneys. If the pelvis is small and entirely intrarenal, i. e., if it is of the bifid or trifid type, spoken of above, pyelotomy











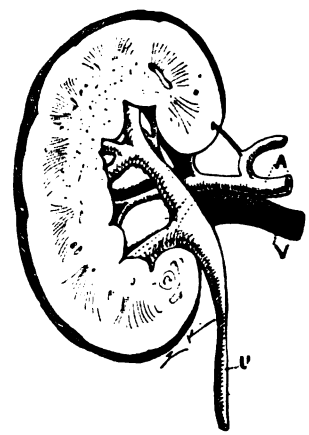


Fig. 6. One renal artery to hilum and an accessory to lower pole arising from iliac.

Fig. 8. Main renal artery enters hilum, and accessory artery passes from aorta to lower pole.

Fig. 10. Three renal arteries, each arising separately from aorta.

Fig. 7. Two separate renal arteries arising from aorta and entering hilum of kidney.

Fig. 9. Main renal artery enters hilum, and accessory artery from aorta to upper pole.

Fig. 11. Posterior view of relation of vessels to renal pelvis (Albarran). A, renal artery. V, renal vein. U, ureter. Note that pelvis is free on posterior aspect except for retropelvic artery (in dotted outline).

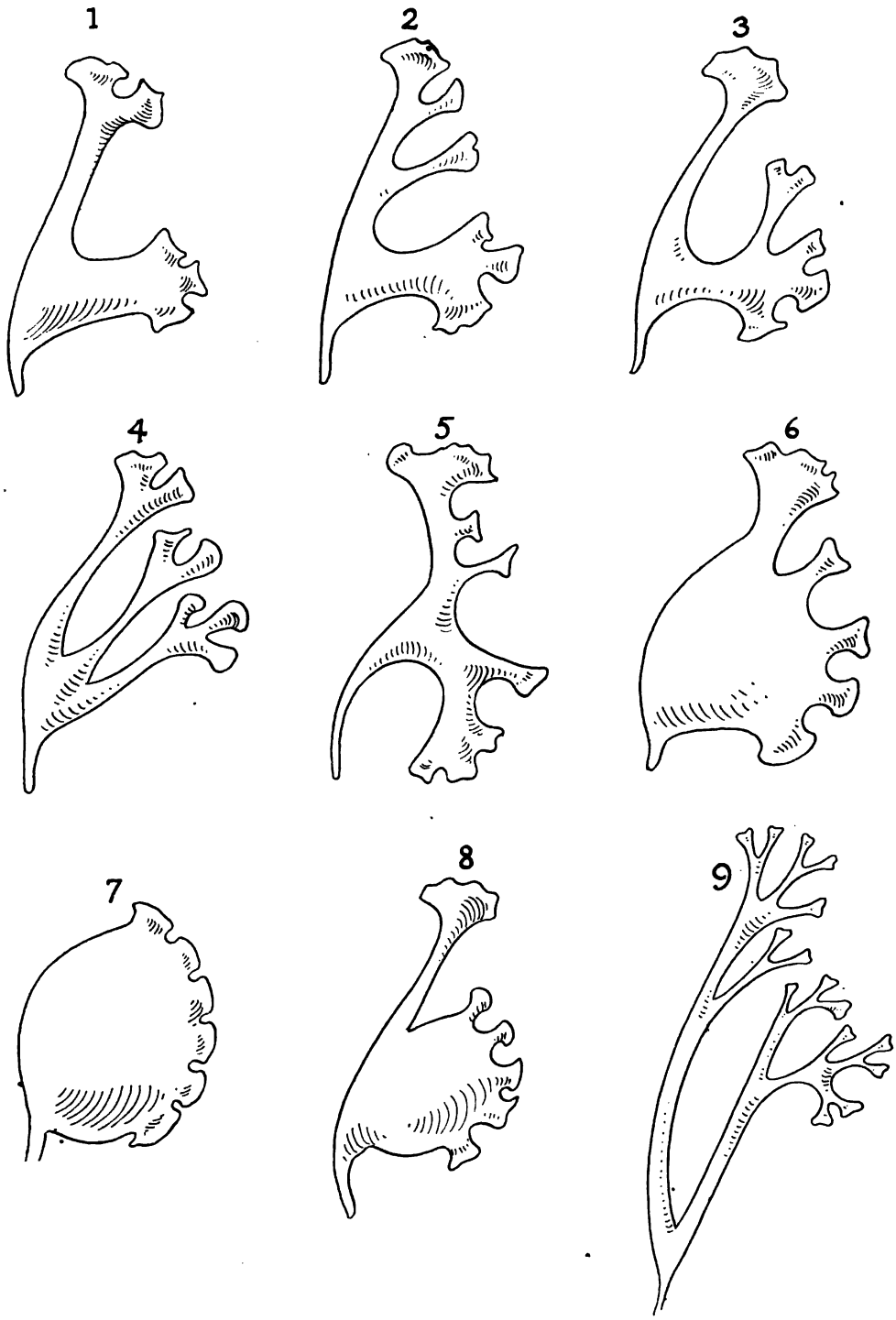


Fig. 12. Various types of renal pelves. 1, 2, and 3, forms of bifid pelves. 4 and 5, trifid pelves. 6, 7, and 8, ampullary forms. 9, unusual bifid type.

Fig. 13. Bilateral renal calculi. Case of Dr. Anna M. Braunwarth. Note long shadow (left) due to calculus extending into ureter.

is almost impossible, unless the calculus is situated close to the orifice of the ureter. In calculi which the X-ray shows to be located at the outlet of the pelvis, the operation of pyelotomy is to be preferred, provided that the other conditions spoken of above do not offer any contraindications.

There is but little danger of fistula following a pyelotomy, provided the urine is aseptic. If it is not possible to remove the calculus by a pyelotomy alone, the incision can be prolonged, according to Zondek, along the dorsal wall of the pelvis into the parenchyma. If the X-ray shows a calculus in the lower pole of the kidney, one can try (by aid of palpation of the exposed kidney) to remove it by pyelotomy, if it lies in the inferior primary division of the pelvis. If the calculus lies in the upper major calyx, nephrotomy is indicated. Pyelotomy cannot be done, as Israel has called attention to, unless the kidney can be fully brought out to the surface of the skin.

Nephrotomy is indicated if a branched calculus is present, or if multiple calculi are scattered throughout the kidney or in the parenchyma. There is only one danger in nephrotomy, and that is hæmorrhage, but this can be reduced to a minimum if compression of the vessels at the pedicle is made during the incision into the kidney. This compression can be either with the fingers or with some clamp. The clamp cannot be applied unless the kidney pedicle is fairly long and the kidney can be brought well into the wound. Digital compression performed by an assistant is, as a rule, tedious. Some operators use a rubber constrictor around the renal vessels. But this has no particular advantage over the clamp, whose blades are covered with rubber tubing.

The questions which arise in cases of bilateral calculi are whether one should operate in two sittings or remove the calculi from both kidneys at one sitting. The majority of surgeons are of the opinion that it is best to employ the former method, the indications for nephrectomy being the same as those to be outlined below.

There is only one danger in operating these cases in two sittings, and that is, calculus anuria may result from blocking up of the opposite kidney after removal of calculi from the one side. This condition, however can be readily remedied by removing the calculus from the obstructed ureter.

Indications for nephrectomy. The method used to expose the kidney and to perform the various operations for the removal of calculi, whether nephrotomy, pyelotomy, or nephrectomy, is so generally accepted that it is unnecessary to describe the technique here, further than to say that in a case of nephrectomy one must have accurate knowledge of the condition of the opposite kidney, and the kidney operated upon must be in such a condition that it no longer has any functional capacity, and that its retention is a menace to the patient's life, and will probably require a secondary operation. As to how large a calculus must be in order to afford an indication for nephrectomy, this is a matter of individual experience. Many large calculi have been removed through a nephrotomy incision, with uneventful recoveries. The indication for nephrectomy depends rather upon the amount of kidney tissue which will be left after the removal of the calculus. Extensive destruction of the kidney as the result of suppuration is one of the chief indications for a nephrectomy in calculus cases.

THE FATTY FASCIAL FLAP IN PLASTIC AND OTHER OPERATIONS ON THE PELVIS OF THE KIDNEY

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THE fine grained fat lying in the fascia which is closely attached to the kidney, especially about the sinus and pelvis (inner layer of fatty capsule), is very valuable as a covering after operations upon the pelvis of the kidney, and as a means of protecting the suture-line in the pelvis of a kidney which has been opened for the purpose of removing stones. The plan of utilizing a fatty fascial flap has been employed for the last three years or more in St. Mary's Hospital, and in the considerable number of cases operated upon there has been no leakage of urine, even when the suture coaptation was imperfect.[1]

Of forty operations for the relief of intermittent hydronephrosis (up to December 31, 1909), in sixteen, plastic enlargement of the orifice of the ureter at the juncture of the pelvis was done usually after the plan of Fenger,[2] i. e., a Hœinke Mikulicz pyloroplasty adapted to this situation. In all the cases in which the suture line was protected in this manner, no leakage occurred. Figs. 1, 2, 3, 4.

[1] Mayo-Braasch-MacCarty. Jour. A. M. A., May 1, 1909, pp. 1383–1388.

[2] Fenger. Jour. A. M. A., March 10, 1894, pp. 334–343.

In some of the plastic operations just referred to, after the sutures were in place, it could be seen that at some points the pelvis was not urine tight, yet when covered with the fatty fascial flap, primary union took place. In three instances the nearly or quite detached ureter, after splitting the end on one side to secure a large opening, was sutured to the dilated pelvis by the two-row catgut suture method, like a gastrojejunostomy. The anastomosed area was then surrounded by a fatty fascial flap much as the omentum is used in the peritoneal cavity to protect a doubtful suture line. The result was immediate union and permanent recovery.

St. Mary's Hospital records show one hundred and twenty-two operations for the removal of kidney stones, up to December 31, 1909. Sixty-nine of this number were performed during the years 1907–8–9, and in all in which the stone was confined to the pelvis of the kidney, pelviotomy was done and the suture line covered with the fatty fascial flap. Rapid convalescence without urinary leakage was in marked contrast to our earlier experience in

Fig. 1. Hydronephrosis from kinking ureter, caused by anomalous blood-vessels.

Fig. 2. Blood-vessels cut and tied. Fatty fascial flap raised and ureteropelvic juncture divided.

which provision for leakage was usually necessary. The certainty of union without the necessity of kidney drainage, or the danger of secondary hæmorrhage, etc., has enabled us to substitute pelviotomy for nephrolithotomy as a method of operation for stone in the pelvis, in nearly all cases.

When operating for stones in the pelvis of the kidney it will often be found that there is considerable increase in the fatty tissue attached to and covering the pelvis. If so the attached fat is not removed, but the incision made directly through it as a part of the wall of the pelvis and sutured as a part of the same with No. 1 catgut. Even should the coaptation of the pelvis incision be imperfect, in our experience the fatty covering has efficiently protected against leakage. If the opening in the pelvis is large and irregular from tearing during the removal of a close fitting rough stone, a flap of the fatty fascia can be made from the vicinity and turned across to more perfectly protect the closure. In one instance the pelvis was detached in three-fourths of its extent from the kidney sinus during the removal of a great number of stones from the pelvis and ureter. The patient was obese — the kidney deeply placed and it appeared as though nephrectomy would be necessary; but the pelvis was sutured back to its position with catgut sutures taking in the kidney substance, and the suture-line covered with the fatty fascial flaps. Primary union followed.

In using the fatty fascial flap it is not necessary to suture it closely but merely to place it over the point to be protected and hold in place with two or three catgut sutures applied in such a manner as to keep the parts in apposition.

For operations upon a kidney which is not the seat of a new growth (unless of large dimensions) we use the posterior oblique incision. The patient is placed prone with moderate elevation of the loins, exposing both lumbar regions so that the second kidney can be quickly exposed from behind, if necessary to obtain exact knowledge as to its condition before undertaking a serious operation on the organ primarily affected. The incision is made about four inches in extent, starting two or three inches from the spine above the twelfth rib, extending downward to the iliac crest in a line with the outer border of the quadratus lumborus muscle. If necessary the incision

Fig. 3. Plastic operation on ureteropelvic juncture completed.

Fig. 4. Fatty fascial flap in position, and held by a few catgut sutures.

is enlarged and the twelfth rib is exposed and divided behind the angle. In doing this the pleura is sometimes opened, and if this occurs it should be sutured with catgut to the posterior muscles by deep sutures. We have opened the pleura a number of times in such cases, but with the patient lying on the face during operation, have never seen collapse of the lung or any harm follow.

Kelly[1] justly calls attention to the superior lumbar triangle as a most important landmark in surgery of the kidney. Incision through this space gives ready exposure to the organ.

Care should be taken not to divide the ileo-inguinal and the ileohypogastric nerves which run in the line of incision. The kidney is drawn up into the wound and the pelvis and upper ureter exposed in the kidney notch, usually from behind. In some cases, as shown by Brödel,[2] the blood-vessels pass to the kidney from behind, and, therefore, the notch is more marked in front. The fatty capsule is stripped from the kidney to the extent necessary to free the organ, and a fatty fascial flap raised either before or after making the working incision in the pelvis. After the operation is completed the fatty fascial flap is placed in position and held by a few catgut sutures; the kidney is replaced and drainage secured by folded strips of rubber tissue, not with gauze, as that might lead to secondary fistula.

[1] Kelly. Jour. A. M. A., January 15, 1910, p. 233.

[2] Brödel. Johns Hopkins Bulletin, January, 1901.

CHORIOMA

A Clinical and Pathological Study

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WHEN, in 1895, Marchand demonstrated that the decidual sarcoma, or "deciduoma malignum," of Sänger is derived from chorionic epithelium and named this tumor "chorioepithelioma," it was felt that not only had important progress been made in the theoretical knowledge of this disease, but that the difficulties surrounding the diagnosis and prognosis of these growths would shortly be removed. This latter hope, however, was destined to fail. As reports of cases multiplied it became more and more apparent that tumors of chorionic epithelium exhibit a remarkably wide variation in histological structure, that the relation between histological structure and prognosis is extremely uncertain, and that many curious features of the natural history of these growths, especially the spontaneous recovery of apparently hopeless cases, are wholly unparalleled by other malignant neoplasms.

To-day it may justly be said that the study of chorioepithelioma presents more peculiar problems and its diagnosis, prognosis, and treatment encounter more special difficulties than exist with any other known tumor process. Especially the introduction of the term "benign chorioepithelioma," together with the claim that the histological structure gives no indication of the probable course of the disease, as once admitted by Marchand, maintained by Schlagenhaufer, and urged by many later writers, has greatly added to the perplexities which meet the clinician and pathologist who have to deal with these cases.

To illustrate the uncertainties of prognosis reference may be made to Schlagenhaufer's report, in 1899, of cases of recovery from chorioepithelioma of apparently identical histological structure showing typical syncytium and Langhans' cells, after (1) spontaneous discharge of the tumor mass from the uterus, (2) removal of the tumor by the curette, or (3) by spontaneous regression after partial removal. At the same time the literature offered numerous examples of a malignant and fatal course of tumors said to have had just such histological structure with or without extensive operations. Apparently histological examination could accomplish little more in the field of chorioepithelioma than to determine the general nature of the process, while offering no reliable evidence on which to base a prognosis or direct treatment.

Marchand had divided the chorionic tumors into two classes, typical and atypical, between which were certain transitional forms.

(1) Typical chorioepithelioma is composed of varying proportions of large multinucleated, eosinophile, syncytial masses, and a smaller proportion of mononuclear, polyhedral, lightly staining Langhans' cells. No great importance was attached to the presence or absence of villi or to the varying degrees of metaplasia of these cells. (2) Atypical chorioepithelioma consists of an infiltration of the uterine muscle with large, acidophile, mononuclear cells which Marchand and others have shown to be derived from the fœtal ectodermal cells. The function of these cells, their resemblance to the syncytium, as well as their association with more definite syncytial masses in the infiltrated muscle, led to their designation as syncytial wandering cells. (3) In the transitional cases there is an increasing proportion of syncytium and wandering cells and decrease or absence of Langhans' cells, as compared with the typical tumors. This classification has been adopted generally.

Although Marchand did not at first find any great difference in prognosis between the two main forms, it has since been recognized that the typical cases are usually malignant, while the atypical form is frequently benign. The presence of villi in the tumors has also frequently been mentioned as affording a relatively favorable prognosis, but I cannot

find that the majority of writers emphasize the prognostic importance of this feature.

Accordingly, the student of chorionic tumors or the practitioner who encounters one of these cases, unless he can acquire a somewhat intimate familiarity with the extensive literature, finds that under the single term "chorioepithelioma" are, on the one hand, benign processes for which Menge declared it to be a crime to remove the uterus, because it is unnecessary, and, on the other hand, cases for which Schmauch virtually admits that it is a crime to remove the uterus because it only hastens the fatal issue. When the inquirer turns to the natural source of help, histological structure, he will find some difficulty in recognizing the atypical variety and remain in doubt what to do with it, or, in the presence of any of the signs of the typical tumor, he will at once remove the uterus on account of the vague and uncertain state of opinion regarding the prognosis in this group of cases. Too often the diagnosis of chorioepithelioma of any variety throws the practitioner into panic and results in immediate hysterectomy, while it is evident that both in this country and abroad the uterus has been removed because it held the remnants of a harmless mole.

Not all observers have been content to leave the question of prognosis in this uncertain state. v. Velits and Meyer, among others, have attempted to distinguish by means of minute histological features between the benign and the malignant tumors, but their conclusions have not received the attention they probably deserve. Moreover, it still remains difficult to determine from the literature what one may believe regarding some of the remarkable clinical features of the disease, such as the alleged recovery after the occurrence of pulmonary metastases, or after partial removal of malignant growths, the possible relation of malignancy to abortion, hydatid mole, and full term normal gestation, the importance of the so-called natural resistance of the patient, and the influence of ovarian secretion in the etiology of chorionic tumors.

From observations on several cases of chorionic tumors, some of which are here reported, and from a somewhat laborious study of the literature, I have been led to believe that more importance can be attached to the histological diagnosis of these tumors than is often claimed, and that certain general relations between histological structure and clinical course can be established which it is of practical importance to point out. It seems highly desirable that the different types of a tumor process which varies so much in structure and clinical course should be designated by more specific terms than are at present in use, and it is proposed to suggest such specific terms. Finally it seems worth while, at the risk of adding unnecessarily to the many miscellaneous discussions of this type, to briefly consider the evidence bearing on some of the remarkable clinical features of chorionic neoplasms.

The observations and comprehensive reviews of the literature published by Teacher, Risel, Munzer, and Schmauch, greatly facilitate the study of this subject and render unnecessary any complete bibliography at this time. The American cases up to 1906 have been reviewed by Frank.

STRUCTURE OF EARLY FŒTAL VILLI

As chorionic tumors arise from the fœtal villi the interpretation of the tumor structure requires a comparison with the normal tissues giving rise to the neoplasm. The early fœtal villi have been studied by Marchand from this point of view.

At the implantation site of the two weeks' ovum he described the irregularly folded ovum as surrounded by villi which reach a length of one millimeter. The villi are composed of a core of mucoid embryonal connective tissue containing a few delicate blood-vessels supported by spindle- and star-shaped cells, and surrounded by two layers of lining cells. The cells of the inner layer, Langhans' cells, are polyhedral, clear staining, with large vesicular nuclei showing remains of occasional mitotic figures. These cells in some places fail to form a continuous layer. The outer layer is composed of flat, syncytial masses, acidophile, continuous, and exhibiting a finely ciliated border. The two layers of cells are sharply demarcated but occasionally transitional forms appear, and this fact together with the close apposition of the two layers led to the conclusion that both layers have a common fœtal

Fig. 1. Normal chorionic epithelium. Ten day fœtus.

Fig. 2. Regressing hydatid mole. Case 1.

Fig. 3. Stationary hydatid mole. Case 2.

ectodermal origin. On this point Marchand is in accord with Peters but at variance with Langhans, yet all these authors express themselves cautiously regarding the evidence on which their views are based. At the tips of the villi the syncytium is often drawn into projecting buds, and some loose syncytial masses are found in sections, while at the bases of the villi there are occasionally seen thicker masses of cells chiefly of Langhans' type.

Where the villi penetrate the decidua the syncytial cells are increased in number, assume a spindle or polyhedral type, and form a layer which irregularly invades the maternal tissue. Some definite syncytial masses may also be found in this situation in the musculature. These ectodermal wandering cells surround the walls of uterine sinuses and become mingled with decidual cells. Many villi, however, are separated from the decidua by a layer of fibrinoid material, Nitabuch's membrane.

These features of the early chorion are the chief and sufficient basis of the view that the atypical chorioma is a tumor of fœtal ectoderm, since the cells of that tumor exactly resemble in morphology and behavior the early fœtal ectodermal cells. For the better appreciation of these few facts regarding the early chorionic structure, which are all that are necessary for the present purpose, Marchand's excellent sketch may be studied. A photograph of the villi of an ovum, 2.2 mm. in length, showing eight dorsal segments, and estimated to be of ten days' development, is also offered. (Fig. 1.)

THE HYDATID MOLE

This well known pathological condition has an important relation to chorioma, since a large proportion of chorionic tumors develop after hydatid mole. The structure of hydatid moles varies greatly and the chief practical question concerns the grade of proliferation exhibited by Langhans' cells and the syncytium. In some cases these cells fail to exhibit any increased growth and such moles generally

pursue a favorable course. In other cases the proliferation of cells is considerable and such processes either suggest malignancy, or the proliferation reaches a neoplastic grade, displays definite characters of an invasive tumor and falls in the class of chorioma. One encounters all gradations between the above extremes and some experience is necessary before one can decide just what histological appearances are harmless and what must be regarded with suspicion. To illustrate this field the following cases are recorded.

CASE 1. *Hydatid mole. Regressing. Suppurating corpus luteum cyst.*

Mrs. X., Austrian, 30 years, multipara. Last child, February, 1900. No miscarriages. Admitted to Lying-in Hospital, February 1, 1902, service of Dr. W. S. Stone, to whom I am indebted for the clinical history and material. On admission patient was suffering from marked pallor and albuminuria, while the abdomen was of the size of full term gestation. Diagnosis, dead fœtus. The uterus was emptied of a large hydatid mole about three liters in bulk. February 10th the uterus was again curetted on account of recurring hæmorrhage. A small tumor was then noted above and to left of uterus. April 10th the patient re-entered the hospital for recurring hæmorrhage, weakness, and loss of flesh. The tumor was larger, and tender. The uterus was enlarged, cervix badly eroded and bathed in muco-pus tinged with blood. Laparotomy revealed a large cystic tumor of the left ovary attached to omentum, intestines, and uterus. It consisted of thickened omentum and a suppurating corpus luteum cyst. For surgical reasons the uterus was removed with the tumor. Three months later the patient reported well.

The mole contained a large number of dilated translucent vesicles of large size, many systems of small opaque vesicles, and considerable fibrin coating many vesicles and forming large coherent masses. No trace of the fœtus could be found.

Microscopically many of the villi are distended with fluid, some show loose calcific deposits, and some exhibit a cellular stroma. Blood-vessels were not recognizable. The chief cells in evidence are scanty, low syncytial buds with well staining nuclei. The syncytium forms a continuous flat layer along the villi. Langhans' cells are not clearly defined, but at the bases of the villi syncytium is missing, and the lining is composed of two or three layers of polyhedral cells with clear protoplasm. The syncytium is often broken up into large or giant mononuclear cells resembling syncytial wandering cells. At many points the cell lining of the whole villus is necrotic and covered with fibrin. Over some villi the cell lining has the appearance of stratified squamous epithelium. The whole appearance is that of very feeble cell life, with regression, degeneration, and necrosis prominent. (See Fig. 2.)

The uterus contained no trace of the mole. The tumor was a multilocular cyst lined by suppurating granulation tissue containing many large degenerating lutein cells and immense numbers of plasma cells.

CASE 2. *Hydatid mole of early chorion. Very slight proliferation of syncytium. Favorable course.*

Mrs. M. M., 19 years, married two months. Last menstruation, February 22, 1909. On March 30th there was pain in pelvis with severe hæmorrhage from vagina lasting six hours. April 6th hæmorrhage recurred. April 25th a third hæmorrhage. April 26th patient was admitted to Bellevue Hospital, service of Dr. Barrows, to whom I am indebted for the history and material. She was then well nourished, but anæmic, restless, and anxious. Pulse 112, temperature 100° F. The fundus uteri reached two inches above umbilicus. Os firm, contracted, discharging bright blood. Red cells, 2,620,000; leucocytes, 31,000; polynuclears, 85 per cent. Operation by Dr. Barrows. A small mass of tissue two inches in diameter, resembling placenta, was found in the vagina. A small attached cord led into a blood clot, no fœtus being found. The uterus was cleared by the curette of two liters of hydatid mole, and irrigated with hot saline. A profuse bloody discharge continued for two weeks, becoming purulent and then gradually subsiding. On May 15th the temperature was normal. May 15th, discharged cured, the uterus being completely involuted, not tender, free from discharge. There has been no recurrence.

The specimen exhibited the usual features of hydatid mole, but with great preponderance of uniformly small translucent vesicles. Microscopically the stroma of the villi was rather cellular and often without marked hydrops. The syncytium showed a moderate number of low buds and Langhans' cells were scanty. (See Fig. 3.)

CASE 3. *Hydatid mole. Considerable proliferation of syncytium. Favorable course.*

Mrs. M. F., 21 years, primipara, no miscarriages. Menstruated last on June 1, 1905. September 15th there was sharp pelvic pain and two ounces of blood were discharged from uterus. These attacks were repeated at intervals, and a slight bloody discharge was noted nearly every day. In October small grape-like bodies were several times noted in the discharge. On November 17th the pain and hæmorrhage were severe and protracted, and larger masses of grape-like bodies were discharged. When packing the vagina failed to stop the bleeding, on November 19th the patient was sent to the Manhattan Maternity Hospital, service of Dr. Edgar, to whom I am indebted for the history and material.

On admission the general condition was good. Uterus reached to umbilicus. Moderate bloody discharge from patulous os. No fœtal heart sounds. Pulse 120, temperature 100° F. Labor pains began at 8 P. M. A large hydatid mole without trace of fœtus was delivered spontaneously at 11 P. M. The uterus was further cleared by the hand, and then by a sharp curette, and irrigated with saline, by Dr. B. H. Gray. Bichloride douches were continued for ten days. The

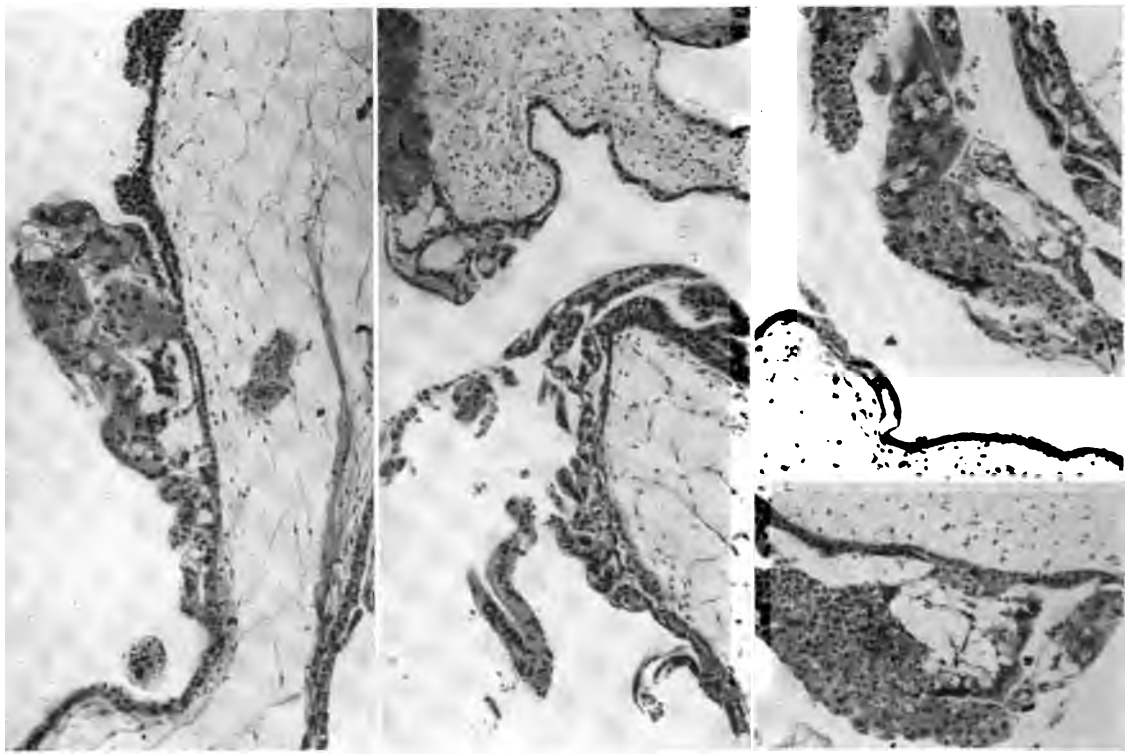

Fig. 4. Hydatid mole. Localized proliferation. Case 3.

Fig. 5. Hydatid mole. Syncytial proliferation. Case 3.

Fig. 6. Hydatid mole. General proliferation. Case 4.

lochia steadily diminished, the uterus involuted normally, there was slight fever, 100° F., for five days, but on December 4th the patient was discharged cured, the pelvic organs revealing no abnormality. For eight months thereafter she was at the Vanderbilt Clinic under the care of Dr. Ellice McDonald, who informs me that the ovaries were not enlarged, the pelvic organs were normal, and there were no signs of any tumor process.

The mole was of considerable dimensions, and contained many large vesicles and more numerous small opaque globules covered with fibrin and blood clot. Microscopically the epithelium covering the villi showed distinct hyperplasia, especially of the syncytium, which in many foci formed a high vacuolated net work or long tongue-like projections. The greater part of the lining, however, consisted of one or two layers of low cuboidal cells. Langhans' cells were found in some compact groups but were hardly more numerous than in many early normal placentas, and they failed to show mitoses. On account of the proliferating syncytium, a guarded prognosis was given. Nevertheless the patient made a rapid and complete recovery. Possibly the curettage was an essential step in this recovery. (See Figs. 4 and 5.)

CASE 4. *Hydatid mole. Distinct proliferation of syncytium. Favorable course.*

Mrs. T. V., 35 years, Greek, 9-para. Last menstruation, February, 1903. April 10th, patient noticed enlargement of abdomen and some loss of flesh. May 10th there were hæmorrhage from uterus, pelvic pain, and prostration. The hæmorrhages were repeated daily. About May 30th the abdomen enlarged rapidly. June 7, 1903, admitted to Bellevue Hospital, service of Dr. W. M. Polk, to whom I am indebted for the history and material. Patient was found poorly nourished, weak, and anæmic. Temperature 99.8° F., pulse 90. Uterus enlarged as in pregnancy. Os patulous, mucoid discharge. June 8th there was severe hæmorrhage with pain and vomiting. Fundus now rose to a level midway between umbilicus and ensiform. June 9th, uterus at ensiform, firm, tender. Severe abdominal pain. Temperature 103°. Under ether uterus was emptied of a large hydatid mole without trace of fœtus, but with a portion of apparently normal placenta. Considerable discharge continued until June 5th, but yielded to daily saline douches. June 16th, red cells, 2,240,000, leucocytes, 35,000. Temperature 99°. For a few days there were headache and pains in the legs. On July 2d the uterus was well involuted, free from discharge, and the patient was allowed to go home. A year later she was alive and well.

The material received consisted of a large hydatid mole filling a two-liter jar. It contained a moderate number of large translucent vesicles and an unusually large proportion of small opaque globules in branching systems. No fœtus or normal placental tissue were

found. Microscopically the structure was very similar to that of case 3, but about some villi the proliferation of syncytium was rather more advanced. Langhans' cells were scanty and no islands of mitotic cells were found. The complete involution of the uterus, the rapid general improvement, and the freedom from recurrence support the conclusion drawn from the histological study that the process was entirely benign. (See Fig. 6.)

Summary of observations on hydatid mole. The foregoing cases illustrate the scope of structural variations of the benign hydatid mole. In a series of fourteen hydatid moles which I have examined for this purpose the structure fell between the limits described in cases 1 and 4. In the cases showing the greatest proliferation, 3 and 4, there were some foci in which the syncytium was more abundant and vigorous and the areas of Langhans' cells more extensive than is seen in normal placentas, but this excessive cellular activity was not marked by any progressive changes in the morphology of the cells. It is significant also that in these cases the proliferating cells were limited to small foci while most of the cell layer was normal or regressing. On comparing these suspicious moles with the chorionic structures in abortions one finds that moderate excess of syncytium and Langhans' cells is not uncommon in the absence of hydatid changes in cases which are not followed by any tumor of the uterus. Comparing these same changes with the earliest genuine neoplasm of the chorionic epithelium, as illustrated in case 5, one finds a wide gap between the most suspicious of the moles and the genuine tumor. The conclusion may therefore be drawn that the proliferation of cells in these moles is not neoplastic. The fact that the curette was capable of removing the entire chorionic mass shows that it had not invaded the sinuses as does the so-called malignant placental polyp.

On account of the abundance of syncytial buds and Langhans' cells present in cases 3 and 4, and of the complete cure by curettage, the suspicion arises that some cases of chorioma reported as recovering spontaneously, or after curettage, were only relatively harmless moles. Yet many hydatid moles are followed by chorioma. While the structure of such moles has not been fully determined, it seems reasonable to assume that a mole which penetrates the sinuses sufficiently to escape the curette must show more extensive cell growth than was exhibited by the cases here reported. The frequency of chorioma following hydatid moles renders it advisable to treat all cases by thorough curettage. The occurrence of partial molar degeneration, the possible variation in structure of different portions of the same mole, and the influence of the period of gestation at which the mole arises upon its structure, are topics on which the present cases offer no definite data.

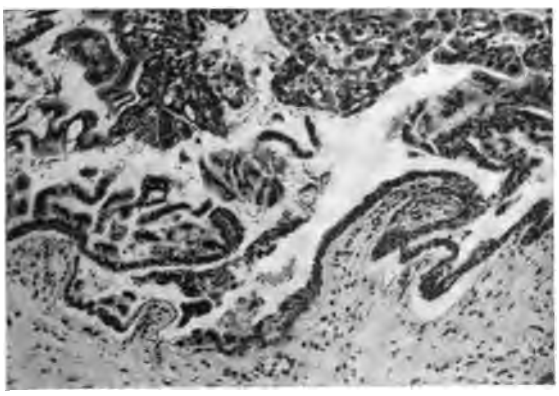

Fig. 7. Chorioadenoma. Case 5.

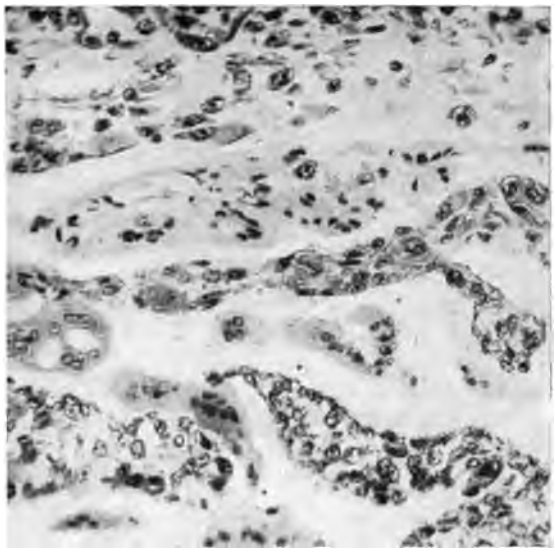

Fig. 8. Chorioadenoma. Case 5.

In only two cases was the condition of the ovaries determined. In one there was a suppurating corpus luteum cyst, while in another no enlargement of the ovaries was detected shortly after the expulsion of the mole.

CHORIOADENOMA DESTRUENS. MALIGNANT PLACENTAL POLYP. TYPICAL CHORIOEPITHELIOMA, MARCHAND

When the mildest type of a genuine neoplastic process becomes established in the chorionic epithelium the resulting structure is extremely characteristic. The tumor is composed of elongated hypertrophic villi clothed with actively proliferating cells of both types. Such villi infiltrate the uterine sinuses usually over a wide area, enlarging the organ uniformly and often projecting as a polypoid tumor into the uterine cavity. The term destructive placental

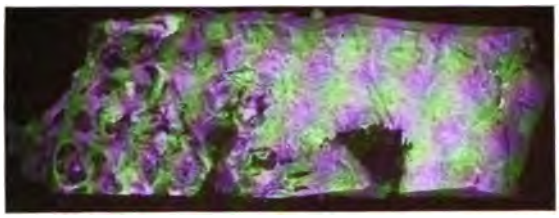

Fig. 9. Chorioadenoma. Distension of uterine sinuses. Case 5.

polyp is well adapted to these gross characters although the growth is seldom polypoid. According to the reported cases this tumor tends to remain long confined to the uterine cavity or wall, but in many instances extensions have occurred to the broad ligaments and pelvic veins, and metastases in the vagina containing villi, or in the lungs, where whole villi were once found by Solowij and Krzyskowski. It rarely, if ever, produces general metastases. It is this tumor which has been found subject to such great variation in clinical course, to be discussed later. The tumor reproduces in rather orderly fashion all the structures of a normal villus. Apparently the cells possess a limited capacity for growth apart from the core of the villus.

Whole villi, however, are not always retained, or if present are not always encountered in

Fig. 10. Choriocarcinoma. Uterus. Cystic ovaries. Case 6.

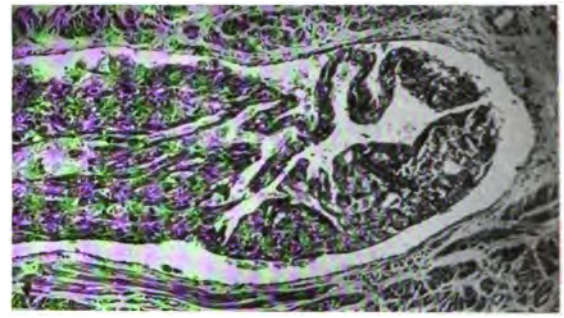

Fig. 11. Choriocarcinoma in uterine sinus. Case 6.

tumors of this type. They may be found in one portion of the tumor but not in another, or in the main tumor but not in the metastases. While the presence of the villi is a very definite and reliable ground for classification, more constant and important criteria are the presence of rather orderly branching buds of vacuolated syncytium and sharply defined Langhans' cells which show no pronounced metaplasia or morphological variation from the normal type. (Figs. 7 and 8.)

These histological characters, and the fact that they are associated as a rule with distinguishing clinical features which are of much practical importance, lead the writer to suggest for this type of chorioma the term *chorioadenoma destruens*.

In 1886 H. Klotz employed the term "adenoma of the placenta" to designate the structures found in three cases of destructive placental polyp. Although Klotz failed to distinguish between the normal hypertrophic uterine glands and fœtal ectodermal elements of the tumor, some of the structures which impressed him as adenomatous were buds of syncytium and Langhans' cells and possibly fœtal villi. Munzer, in commenting upon Klotz' suggestion, exclaims, "Since when has the placenta had glands!" Yet the placental villi are glands in every essential respect, both anatomical and physiological, and a tumor which reproduces in an orderly manner the structures of a glandular organ is by current definition an adenoma.

The grounds for separating the destructive placental polyp from other forms of the typical chorioma are chiefly practical ones. It makes

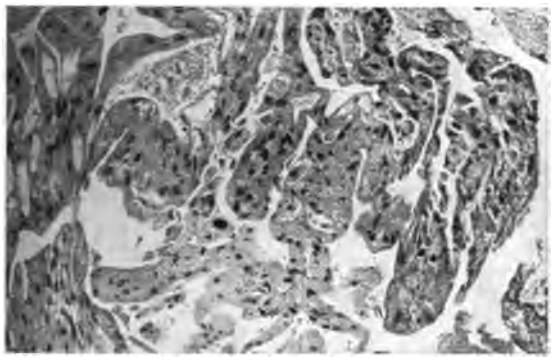

Fig. 12. Choriocarcinoma. Case 6.

much difference to the clinician and to the patient whether the laboratory diagnosis carries with it a necessarily hopeless prognosis or a chance for recovery, and it is just because the average destructive polyp offers a hopeful prognosis which some other typical choriomata do not, that specific terms are desirable.

The following case illustrates the distinguishing features of chorioadenoma destruens or destructive placental polyp.

CASE 5. Mrs. K., age 48, always well, had eight living children, two abortions. Five months before coming under observation had an abortion at the third month, which was followed by such profuse hæmorrhage that she was curetted. Curettings not examined. The bleeding continued. At this time the uterus was found to be uniformly enlarged to the size of a four months' gestation, and was bleeding continuously. A malignant tumor was diagnosed and supravaginal hysterectomy performed, after curettage. The patient did not recover from the operation.

The specimen as received by the writer was a much enlarged uterus, measuring eleven cm. in lateral diameter at the fundus. The cervix was missing and the cavity had been laid open so that it was impossible to determine the other diameters or to restore the organ to its original form. The cavity had been cleared of any polypoid outgrowths by the curette, but was considerably enlarged.

The tumor occupied chiefly the left side of the fundus wall, extending from the mucosa to the peritoneum. This portion of the wall, seven cm. in diameter, is everywhere infiltrated by solid grayish, hæmorrhagic masses and translucent mucoid nodules of tumor tissue distending the uterine vessels. Some of these masses produced nodular elevations of the surface but had not perforated the peritoneum. The right and posterior portions of the uterus are free from tumor but the wall is much thickened (2.5 cm.). The main gross feature of the uterus is therefore an extensive honeycombing of the uterine wall without perforation, and is illustrated in Fig. 9.

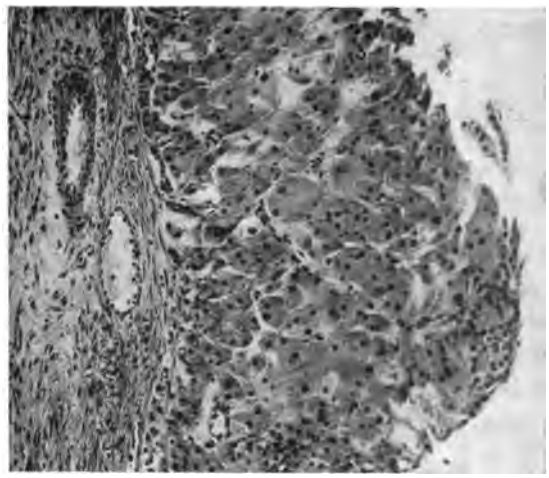

Fig. 13. Hypertrophic lutein cells in ovarian cysts. Case 6.

The ovaries were not removed with the uterus and their exact condition was not determined.

Microscopically the tumor tissue is apparently limited to the uterine sinuses, which are widely distended by large villi with thickened stroma and hypertrophic epithelium. The villi are greatly elongated and the stroma shows an abundance of well preserved cells, or they are widely distended by thin mucoid material. Nearly all the villi are covered uniformly with proliferating syncytium which is often branching and vacuolated but without mitoses.

About many villi are islands of Langhans' cells, which are sharply demarcated from the syncytium, and show occasional mitoses. Both syncytium and Langhans' cells are well nourished and exhibit the histological signs of complete vitality.

The sinuses contain considerable blood and old and fresh fibrin and these masses are often fringed with

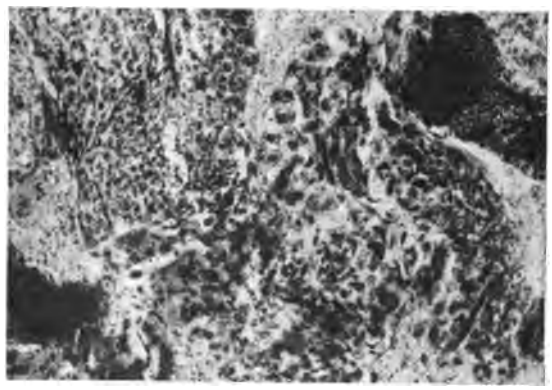

Fig. 14. Choriocarcinoma. Uterine curettings. Case 8.

fragmented syncytial cells. Some of the masses also contain necrotic villi. The muscle tissue shows very little infiltration with syncytial wandering cells.

The main microscopical feature of this case is the neoplastic but orderly proliferation of two well defined types of cells which appear to be somewhat dependent for vitality upon their connection with villi.

Epicritical considerations. The first practical conclusion that may be drawn from this case is that the typical destructive placental polyp is strikingly different in histological structure from the innocent hydatid mole. In the suspicious hydatid mole there are occasional groups of proliferating cells which suggest a capacity for the independent existence of a tumor, but in the destructive placental polyp it is apparent at a glance that one is dealing with a genuine neoplastic process. Here as in other fields the distinction between simple and neoplastic hyperplasia reveals itself in an unmistakable manner. It is possible that a larger experience would yield intermediate cases in which it would be difficult to decide whether one had to deal with a true neoplastic process or a harmless proliferation. Yet such conditions are generally rare. In the mucous membranes, kidney, liver, prostate, thyroid, and breast, a genuine adenoma is usually clearly recognizable as such, and the same rule seems to apply to the chorion. Hence the writer concludes that there is probably a wide gap between a simple hydatid mole and the earliest true neoplasm of the chorionic epithelium.

Second. The question arises what term properly designates the earliest true neoplasm of the chorionic epithelium. The tumor process affects only the epithelium, causing an orderly proliferation with slight metaplasia and preservation of cell types. The stroma of the villi shows no neoplastic qualities and the elongation of the villi appears to be largely mechanical or at least secondary to the epithelial growth. For such a process affecting a glandular organ the term adenoma seems to accord with established usage.

The term chorionic papilloma is also adapted to emphasize the branching buds of syncytium, but seems less appropriate for the various cellular structures of a complex glandular organ such as the chorion. That the chorion is a gland has already been urged.

Third. It may be objected that there is no necessity for emphasizing the existence of this special variety of typical chorioma or of introducing a new term for a growth which has much the same course and histology as other choriomata, for chorioadenoma produces metastases, it may prove fatal, and in curettings it may be difficult to separate from other typical choriomata.

It is true that chorioadenoma produces metastases, but these are apt to be limited in extent, and, as will be shown later, they may undergo spontaneous regression, whereas metastases from other types of chorioma, with a few possible exceptions, have never been known to regress. The fatalities from chorioadenoma are not so much from the progressive invasion by the tumor as from local hæmorrhage, infection, or other accidents.

The *course* of chorioadenoma resembles in many respects that of more malignant choriomata, but differs nevertheless in essential particulars. (*a*) It tends to produce greater enlargement of the uterus, often with polypoid tumors distending the cavity, and only slowly perforates the organ with extensions into the pelvic veins. (*b*) It may be cured by curettage or by partial removal, and perhaps by spontaneous expulsion, results not observed with more malignant tumors. (*c*) Its definite histology is easily recognized in any thorough examination of the mass of curettings that are obtainable by a careful operator from such cases. I conclude, therefore, that there exists a special variety of Marchand's typical chorioepithelioma, often called destructive placental polyp, for which there are adequate theoretical and practical reasons for introducing the term *chorioadenoma destruens.*

The *treatment* of such cases offers unusual difficulties. When the diagnosis of chorioadenoma is established the controlling consideration is the moderate potential malignancy of the tumor. It is not necessary at once to extirpate the uterus. It is necessary first to ascertain the extent of the involvement of this organ. A greatly enlarged uterus with constant or alarming hæmorrhage, or with severe infection, would seem to call for hysterectomy. Even the presence of signs of metastases, or inability to remove all the invaded pelvic

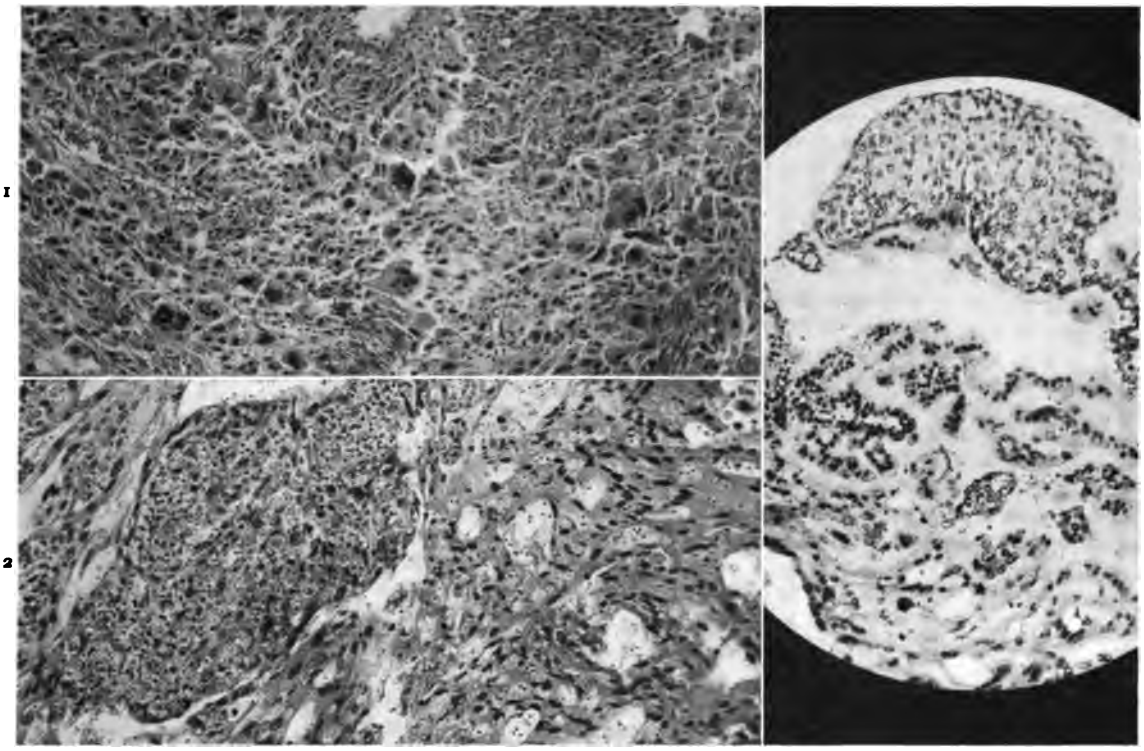

Fig. 15. (1) Syncytioma. Case 9. (2) Choriocarcinoma. Case 6. (3) Chorioadenoma. Case 5.

tissues, should not delay the operation or warrant a necessarily hopeless prognosis.

With tumors less advanced, in young subjects in whom the loss of the uterus is a serious consideration, conservative treatment is clearly indicated. In such cases it would seem that the uterus should be thoroughly explored and curetted and any vaginal metastases removed. If the symptoms recur and curettings still show that the curette has not removed all the tumor tissue, hysterectomy is then the indication. The time required to determine the result of the first curettage is an uncertain feature of this plan, but with chorioadenoma the necessary delay will not greatly influence the prognosis, while it may save the uterus.

CHORIOCARCINOMA. MALIGNANT TYPICAL CHORIOEPITHELIOMA OF MARCHAND

The majority of malignant tumors of the chorion exhibit a structure quite different from that of the process designated as chorioadenoma. Their chief histological features are absence of villi, and very extensive proliferation and *pronounced metaplasia* of Langhans' cells and syncytium. Their anatomical and clinical characters are illustrated by the following cases.

[1] CASE 6. [1] *Choriocarcinoma. Recurrence after curettage and after hysterectomy. Local and general metastases. Bilateral cystic ovaries. Death twenty-one months after first symptoms.*

Clinical history. Mrs. X., 35 years of age, had three healthy children. General neurotic symptoms of several years' duration, attributed to shock, more probably due to atypical Graves' disease.

Last menstruation July, 1905, normal. December, 1905, metrorrhagia appeared, followed in three weeks by delivery of a macerated fœtus. March, 1906, flow returned, and in April she was curetted. Bleeding ceased for a time, but soon returned at short intervals. August, 1906, no symptoms. September 1st, bleeding returned, and uterus was found retroflexed, soft, size of two months' gestation. September 5th, curettage brought away considerable masses of tissue showing typical chorioma.

As bleeding ceased and uterus returned to normal size, and general health improved, it was decided to

[1] A report of this case was published by Dr. J. J. Edgerton, in the New York Polyclinic, 1908, vol. 12, March, p. 31.

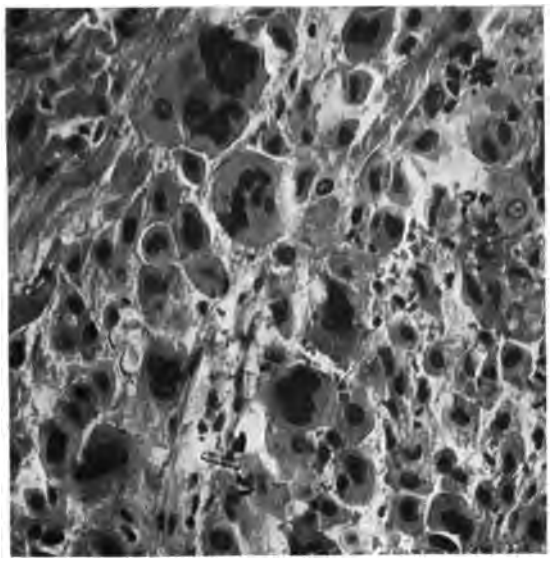

Fig. 16. Giant cells in syncytioma. Case 9.

delay hysterectomy, This decision was influenced by current statements in the literature that histological structure is no guide to malignancy.

November 7th, bleeding recurred and as curettage showed same malignant structure, hysterectomy was done. Patient remained well for some months except for old nervous symptoms, but in July, 1907, there were marked uncertainty in gait, much pain in right knee and hip, dyspnœa, and anæmia. These symptoms, especially the dyspnœa, increased and death occurred September 25, 1907.

Autopsy, twelve hours after death, by the writer.

Body considerably emaciated, anæmic. Slight œdema of lower extremities. Few adhesions over left upper lobe. No fluid in either pleural cavity or peritoneum; about one ounce in pericardium. *Lungs:* Both lungs, especially the left, studded with many solid tumor masses one-fourth to three cm. in diameter, firm, centers light colored, peripheries hæmorrhagic. Remaining parenchyma intensely congested, certain lobules emphysematous. Projecting like a finger into the right auricle from one pulmonary vein and occluding it is a mass of whitish tissue which is continuous through the vein with a tumor mass in right upper lobe. *Heart:* Moderately enlarged, left chambers filled with antemortem clot. Valves and chambers normal. Muscle pale but not fatty. Attached to wall of left auricle is a solid whitish mass size of pea, with several smaller nodules in neighborhood. Pericardium normal. Slight atheroma at base of aorta. *Spleen* slightly enlarged, firm, œdematous, dark, follicles invisible. Small supernumerary spleen. No metastases. *Liver:* Size normal, consistence reduced, surface peculiarly mottled, section strikingly nutmeg, but congested areas irregular. Several small tumor nodules in right lobe. *Kidneys:* Size, consistence, normal; capsule uniformly adherent, shows numerous deep red depressed areas in which markings are absent. Cortex irregular in thickness, markings mostly regular. No gross arteritis. *Adrenals* normal. *Pelvis:* Uterus and ovaries missing, scar smooth, fully healed. Pelvic contents fused together by solid tumor growth which is adherent to peritoneum, compressing anterior crural nerve and penetrates right femoral vein to three inches below ring, and surrounding bladder, vagina and rectum. No metastases project into vagina. *Pancreas* appears normal. Abdominal lymph nodes normal. *Thyroid* small and firm. *Thymus* atrophic. Brain not examined. *Volume of blood* slightly reduced, fibrin normal, slightly watery. *Anatomical diagnosis:* Secondary choriomata of pelvis, lungs, liver. Chronic congestion of liver, spleen, kidneys. Moderate anæmia. Hypoplasia of thyroid.

Uterus: Gross appearance. See Fig. 10.

The uterus is slightly enlarged, measuring 10 x 8 x 4½ cm., cavity 9½ cm., slightly dilated. Occupying the right posterior portion of the fundus wall is a solid, circumscribed tumor mass 4½ x 4 x 3 cm., reaching from the mucosa almost to the peritoneum but not perforating the organ. Except over a limited area at the apex of the uterine cavity the tumor is separated from the cavity and protected from the curette by muscular tissue, so that it would have been quite impossible to reach the main mass of the growth by curettage. No secondary deposits were discovered.

Microscopical examination. Figs. 11 and 12. *First curettings:* The tissue is composed about equally of broad masses of syncytium and Langhans' cells. The syncytium is not found in the form of branching buds but as broad sheets of acidophile protoplasm containing huge nuclei. Langhans' cells appear in broad masses of large polyhedral cells with nuclei very rich in chromatin and frequently showing remains of mitotic figures. Villi were absent.

Second curettings: Show same structure. *Uterine tumor:* The new growth forms a compact mass occupying the uterine sinuses and causing atrophy of intervening muscle tissue. Detached masses of tumor tissue are found in several adjacent sinuses, indicating that metastases had occurred before the hysterectomy. The structure of the tumor closely resembles that of the curettings. The syncytium appears in broad masses of compact anastomosing bands which resemble huge stratified, squamous epithelial cells. There is little vacuolation or degeneration, and the syncytial buds of chorioadenoma are entirely wanting. Langhans' cells are of very large size, but with polyhedral borders, clear cytoplasm, vesicular nuclei rich in chromatin, and showing mitotic figures. These cells are often distinct from the syncytium, but in many places merge insensibly into it. In some sinuses the tumor mass is adherent to the wall and syncytial wandering cells have slightly invaded the muscle. Elsewhere the muscularis is free from syncytial wandering cells. Inflammatory reaction is very slight and there is little necrosis or deposit of fibrin.

The appearance is wholly different from that of chorioadenoma and indicates a neoplastic process of great malignancy.

The *pelvic tumor* masses are composed of areas of Langhans' cells mingled with bands of syncytium. There are many vascular channels walled by bands of Langhans' cells and lined by syncytium. There are many areas of coagulated blood and necrotic tumor tissue.

In the lungs many tumor areas are composed exclusively of Langhans' cells, giving the appearance of an adrenal perithelioma. In some few, however, the syncytium is prominent. The same structures appear in the metastases in the liver. The nodules in the heart muscle are composed of fibrin and pus with necrotic masses in which tumor cells are not recognizable.

Ovaries: Both are much enlarged, 8 x 5 x 4 cm., and contain numerous cysts 1 to 2 cm. in diameter, filled with slightly blood-stained watery fluid. All of these cysts are lined by many layers of hypertrophic lutein cells which give a characteristic yellowish tinge in the gross. Fig. 13

CASE 7. *Choriocarcinoma. General metastases. Early cystic changes in ovaries.*

Clinical history: Mrs. J. M., 27 years. One year after marriage, at fifth month of pregnancy, she had a miscarriage from which there was perfect recovery. One year later, December, 1904, another miscarriage occurred at third month, accompanied by fœtid discharge. At this time she was confined to a hospital in Antwerp for two months. In March, 1905, she came to New York where she enjoyed excellent health. In November she began to complain of a sense of weight in the pelvis. For two months there was some menorrhagia, after which menses stopped for three months. In May, 1906, there was a profuse hæmorrhage, for which curettement was performed. The curettings were said to have contained "little white balls." Thereafter hæmorrhage persisted, there were anæmia, general weakness, failing vision, and later nausea and vomiting. August 7th, there was a general clonic convulsion. On August 15, 1906, she was admitted to Lincoln Hospital, in the service of Dr. L. H. Shearer, to whom I am greatly indebted for very full clinical notes, autopsy records, and the material from the case.

On examination she was now found emaciated, anæmic, with persistent headache and vomiting. The uterus was retroflexed, as large as in three months' gestation. It was somewhat firm, not tender, cervix slightly patulous. There was a slight blood-tinged discharge. Later a small tumor was found behind and to the right of the uterus. August 20th, sudden diplopia of right eye, with dilatation of pupil, followed later in the day by a clonic convulsion. No pulmonary symptoms. Violent headache, vomiting, bloody discharge, delirium, and increasing weakness, ended fatally September 3d, ten and a half months from beginning of symptoms.

Abbreviated report of autopsy, by Dr. Shearer: *Body*: Emaciated and anæmic. *Lungs:* Both lungs are the seat of numerous firm hæmorrhagic nodules .5 to 2 cm. in diameter, projecting on pleural surface and especially on the anterior surface. *Heart:* Negative. *Liver*: Shows chronic congestion and a few small tumor nodules. *Spleen:* Shows one tumor nodule 1 cm. in diameter, well below the surface. *Kidneys:* Few small tumor nodules in each. *Brain:* At tip of left occipital lobe was a hæmorrhagic tumor nodule .75 cm. in diameter. In the left motor area were two small superficial tumor nodules 1 cm. in diameter.

Uterus: The uterus is moderately enlarged by the presence of two rounded swellings, one in the anterior portion of the fundus wall, the other just above the cervix on the posterior aspect. The uterus measures 14 x 8 x6 cm., and the tumors 4 and 6 cm. in diameter. The upper mass is in connection with the mucosa and probably represents the primary tumor. The lower mass is more superficial and is probably of metastatic origin. Both tumors are sharply circumscribed, infiltrated with blood, and their substance readily fragmented. The uterine cavity is not dilated.

Microscopical examination: The ovarian tumors show a structure very similar to that of case 5. The uterine tumors are composed of bands of coarse syncytium traversing areas of very large Langhans' cells. In both cells the nulcei are very rich in chromatin and often of very large size, while the Langhans' cells show occasional mitotic figures. There is little necrosis but some admixture of blood and fibrin. The tumor masses lie in distended sinuses and some of the outlying sinuses contain loose masses of tumor tissue. There is very little infiltration of the muscularis with syncytial wandering cells. Villi are entirely missing.

In the lungs the tumors are composed of central masses of disintegrated blood surrounded by a row of tumor cells which are almost entirely of the Langhans' type. In some small nodules the structure is not to be distinguished from the usual metastases of breast cancer, except by the slight eosin stain of the cell bodies. In the splenic nodules syncytial cells are more numerous. In the brain the scanty cells about the hæmorrhagic areas are large, mononuclear, acidophile, or necrotic. In all the tumors the appearance is that of active cell growth of pronounced malignancy.

CASE 8. *Choriocarcinoma. Pulmonary metastases. Death seven months after first symptoms. No autopsy.*

History: Mrs. E., 42 years, Italian, entered New York Hospital July 14, 1905. Illness began with miscarriage in January, 1905, which was followed by metrorrhagia, pain in pelvis, cough, weakness, loss of flesh, and anæmia. In March menstruation was excessive, very painful, and accompanied by vomiting and prostration, and in April these symptoms were aggravated. In May constant metrorrhagia began. July 4th there was an attack of sharp pain in left side, with dyspnœa, blood-tinged sputum, and night sweats. On admission patient was pale, emaciated, with rapid, small pulse, and a profuse bloody discharge from the uterus. Over both lungs were signs of effusion, and on July 16th and again on July 21st, 70 and 90 ounces of bloody fluid were aspirated. Fig. 14.

The fundus uteri was found 3 cm. above pubes, displaced to right. From the right fornix a mass as large as an orange was palpated. The uterine cavity measured 3¾ inches in depth.

Curettage was followed by profuse hæmorrhage and

little tissue was obtained. The operation was followed by a chill, vomiting, temperature 105° F., and the chills recurred daily. A second curettage failed to relieve the local or general condition and the patient died August 2d. No autopsy.

Microscopical examination of the curettings by Dr. W. J. Elser yielded a very few small groups of tissue cells in large masses of blood and fibrin. Neither typical Langhans' cells, syncytium, nor villi were found. The cell groups resemble those described in case 6, and were composed of large acidophile, multinucleated masses, and large polyhedral cells with large vesicular nuclei very rich in chromatin, and with clear cytoplasm. Necrotic cells and leucocytes were absent.

The chief features of this case are the profuse hæmorrhages, the rapid course, the early pulmonary symptoms, and the scanty curettings. It is probable that the uterus contained very little tumor tissue accessible to the curette.

Epicritical remarks on cases of chorio-carcinoma. Cases 6, 7, and 8 illustrate a common form of typical highly malignant chorioepithelioma. The tumor cells in this group exhibit a remarkable capacity for independent growth apart from villi, they show advanced metaplasia and in the metastases a striking loss of differentiation. They grow diffusely, failing to show the orderly arrangement or polarity of the milder forms of chorionic tumors. Their histological appearance is extremely characteristic and no difficulty is experienced in separating them from the tumors called chorioadenoma. Likewise, the gross characters of these tumors are usually quite different from those of chorioadenoma. In the present cases and in most cases in the literature, the tumors in the uterus are comparatively small, in some instances a primary tumor of the uterus has been missing, the organ is but slightly enlarged, but numerous metastases are found in lungs, spleen, brain, and other organs.

The prognosis also in these cases must always be unfavorable. In the presence of this histological structure one may state positively that one is dealing with a tumor of high potential malignancy. The great majority of these tumors prove fatal in spite of early operations. In fact it is still doubtful if any pure cases of this type have been known to recover, although in a few instances, reported by Marchand, (Everke), Schlagenhaufer, Noble, Findley, Langhans (case 2), etc., to be described later, the structure approached that of choriocarcinoma, and yet the patient recovered.

That recovery may follow after internal metastases have occurred appears to the writer extremely unlikely, and there is no satisfactory evidence in the literature that metastases of tumors of this histological type have ever spontaneously regressed. So far as I can determine from the literature, the regressing metastases have always belonged to tumors approximating in structure chorioadenoma or, from the presence of villi, falling distinctly within that class. It is probable that tumors of intermediate type between the relatively benign chorioadenoma and the highly malignant growths do occur. It need not be claimed that an exact prognosis may be given for every case, yet the great majority of tumors recurring after operation fall distinctly in this class which exhibit striking histological signs of malignancy.

In view of these considerations the writer feels that the value of histological structure in establishing a prognosis in this group of cases has been underestimated, and that here as with most other malignant tumors there is a close relation between histological structure and prognosis.

The treatment of this group of cases should be guided by the fact of the high potential malignancy of the tumor. On finding curettings of the above described structure, one should not delay with a preliminary curettage to see if the tumor persists or the clinical signs of uterine disorder recur. Nor should one be deceived by the good general health of the patient or the absence of uterine enlargement or hæmorrhage. Curettage cannot remove these deeply seated ingrowths and hysterectomy is urgently indicated.

When the process is far advanced and there are signs of local or pulmonary metastases, the question arises whether operation will not hasten the fatal issue. On this point one might be disposed to agree theoretically with Schmauch who holds that it is unjustifiable to remove the uterus in cases of advanced typical chorioepithelioma. Yet the possibility of error in diagnosis from scanty curettings is always present and the responsibility of omitting

operation in any of these cases must be considerable.

Finally, in dealing with a tumor which possesses a characteristic histological structure, exhibits striking gross anatomical features, pursues a rapid malignant course, and demands radical treatment, and differs in all these respects from other chorionic tumors, it would seem that a specific term is a practical necessity. For this purpose the term "choriocarcinoma" is suggested by the histological structure and is consistent with the origin and general pathological characters of the tumor. It is true that Marchand rejected the term carcinoma for any of these tumors, because of the uncertain derivation of the cells of origin and the limitation of metastases through the blood-vessels. Yet the cells of origin are fœtal epithelium, and other metastatic carcinomata may grow extensively through the blood-vessels. While often sparing the lymph nodes, metastases of this tumor have been observed in the lymph nodes by several writers, including Chiari, Menge, Gebhard, and Fiedler. When a tumor of glandular epithelium grows diffusely with loss of differentiation of cell types and general metastases, it is by established usage called a carcinoma. Exactly the same objections apply to the term chorioepithelioma, while in America and elsewhere, the term epithelioma is commonly applied to tumors of stratified squamous epithelium. Choriocarcinoma has an advantage also as a proper correlative of adenoma, indicating that greater malignancy which it is desirable to emphasize.

ATYPICAL CHORIOEPITHELIOMA (MARCHAND)

Infiltration of uterus with syncytial wandering cells. Syncytial endometritis.

Marchand early recognized an atypical form of chorioepithelioma in which actively proliferating Langhans' cells and syncytium were missing, and the growth consisted of an extensive infiltration of the uterine muscle and sinus walls with large numbers of large or giant mononuclear cells derived from the syncytium. Similar cells are seen in small numbers in many typical choriomata associated with typical syncytium and Langhans' cells. In certain cases these syncytial cells may constitute a very prominent feature of the new growth, and such cases are often designated as transitional or syncytial chorioma. There are thus wide variations in the proportion of these cells seen in choriomata, but it is only when they are exclusively present and chiefly within the muscle that they constitute the atypical chorioma of Marchand.

The exact interpretation of the significance of these cells in tumor growths requires a knowledge of their physiological relations.

Marchand first clearly showed their origin from the fœtal epithelium and also the fact that in early gestation the anchoring of the ovum in the uterus is accomplished by the invasion of the muscularis by the syncytial derivatives which invaded the uterine sinuses, causing a solution of muscle cells and facilitating the entrance of villi into the deeper sinuses. Pels-Leusden, Meyer, and others have shown that in normal pregnancy nearly all portions of the uterine musculature may be invaded by some of these cells. The extent of this invasion varies considerably, but it is most marked in the early months and continues to advance until the sixth month, but may be entirely missing in the uterus at term (Meyer).

In addition to this strictly physiological occurrence, syncytial wandering cells seem to represent a form of reduced vitality and metaplasia of the syncytium. Thus in regressing hydatid moles, and in the necrosing or degenerating edges of choriomata and about occluded and degenerating villi of the placenta one finds the syncytium breaking up into cells of this type. Fig. 15.

It has been suggested that an excessive invasion of the musculature by these cells leads to abnormal adherence of the placenta, or to changes in the villi that result in death of the fœtus and hydatid mole. It appears certain that an unusual abundance of syncytial cells often occurs in cases of hydatid mole, that they may cause erosion of vessels and thrombosis, and that the inclusion of excessive numbers of villi in certain areas of the uterine muscle is followed by excessive invasion by syncytial cells.

As the syncytial wandering cells resemble decidual cells, it is often difficult to distinguish between them, and in fact they were once erroneously regarded as identical. The cyto-

plasm of the syncytial cells is more opaque and acidophile and the nucleus larger and richer in chromatin.

There can be no doubt that the syncytial wandering cells are capable of multiplying, for their invasive properties have often been likened to those of a malignant tumor, but that these cells ever develop a progressive malignant tumor in a strict sense is still doubtful. The tumor-like masses in which they are found are often of considerable bulk, but the living cells are associated with large masses of necrotic tissue, blood, pus, and fibrin, all of which infiltrate and greatly enlarge the affected portion of the uterine wall. The structure of atypical chorioma has been described in vaginal metastases, but here the wandering cells may merely represent the regressing derivatives of original syncytium which failed to maintain its full vitality. At any rate large circumscribed, well nourished tumors, composed of syncytial wandering cells with metastases of the same structure have not been observed, so that the general significance of masses of such cells is that of an anomalous regressive process with proliferation rather than of an active progressive neoplasm.

The general features of this class of atypical chorioma are illustrated in the following case, for which I am indebted to Dr. W. J. Elser, Pathologist to New York Hospital.

CASE 9. *Atypical chorioepithelioma. Syncytial endometritis. Streptococcus infection. Acute nephritis. Acute purulent peritonitis.*

History. K. C., 19 years, single, domestic. Entered New York Hospital September 1, 1903.

Had enlarged cervical lymph nodes in childhood and one hemoptysis two years before. For six months had complained of occasional vomiting, and for two weeks, of cough and hemoptysis. There was moderate œdema of feet and legs, and the urine contained albumin and casts. September 20th, abdomen became painful and enlarged and soon metrorrhagia appeared, simulating menstruation. There was much pain in back and buttocks, vomiting, attacks of fever, and pronounced abdominal distension. October 9th four liters of slightly turbid fluid was drawn from peritoneal cavity. Vomiting, anasarca, œdema of labia, anæmia, and fever continued, and patient died October 14, 1903.

Abstract of autopsy, twelve hours post-mortem, by Dr. Elser. *Lungs* extremely congested, some old adhesions. No metastases or consolidation. *Heart* negative. *Liver* congested, moderately fatty. *Spleen* enlarged, soft, deep red. *Kidneys*: Cortex swollen, light colored, with hæmorrhagic points. Capsule adherent, markings obscure.

The *peritoneum* contains 1,500 cc. of slightly purulent fluid, little fibrin, no adhesions. There is a continuous area of suppuration extending from the head of pancreas behind colon down to uterus. Veins of right broad ligament exude pus.

The *uterus* is uniformly enlarged, soft, free from adhesions. Length 12 cm., width 7 cm., thickness 6 cm. The enlargement is due to a tumor growing inward from the fundus, involving the upper two-thirds of the posterior wall and upper third of anterior wall. The uterine wall has a fairly uniform thickness of 1 cm. and is not deeply invaded by the tumor. Necrosis is marked in many parts of the tumor and the exposed surface is irregular and ragged. From the right border of the uterus a tumor 2.5 cm. in diameter projects into the broad ligament. It is distinctly encapsulated, moderately firm, and largely necrotic. The tubes and ovaries are normal.

The chief gross features of this case are the presence of a large tumor originating over a wide area, without deep involvement of the musculature, extensively necrotic, and infected, and causing considerable enlargement of the uterus.

Microscopical examination. Large sections from different parts of the mass revealed surprisingly few living tumor cells. The bulk of the growth is made up of masses of necrotic tissue, fibrin, blood, and pus. The only living cells are found in the inner layers and surface of the musculature, where they appear in considerable masses, lying between muscle fibers and surrounding or occluding sinuses. The line of infiltration by these cells ends rather abruptly, but the tumor and the remaining musculature are everywhere extensively infiltrated with pus and serum. The remains of the decidua are probably included in the tumor but it is impossible to identify any decidual tissue or traces of villi.

The tumor cells are large or giant acidophile cells with single or multiple vesicular, or pyknotic, or fragmented nuclei, without traces of mitosis. They are especially abundant about the walls of sinuses. They are so abundant in places as to suggest a neoplastic hyperplasia, were it not for the evident signs of nuclear degeneration and the irregular distribution. The invaded muscle cells undergo atrophy, the terminal stages resembling the tumor cells. New œdematous cellular connective tissue infiltrated by isolated wandering cells appears in some quantity. See Fig. 16.

Summary of features of atypical chorioma. From the recorded cases, the atypical chorioma appears as a highly characteristic process closely related to the tumors of the chorion, but differing essentially from the two main types of these tumors. In the gross the uterus is much enlarged, often to greater dimensions than are seen with other forms of chorioma. The growth arises from a large area or involves

almost the whole internal surface, as in Cullen's case, or it may be limited to a relatively small area of the uterine mucosa, as in v. Velit's case. It may produce one large intrauterine mass or more often appears as irregular globular masses surrounding the enlarged uterine cavity. It is doubtful if it ever perforates the uterus, but as in the present case secondary tumors may arise from emboli in the uterus or broad ligament. Fleischmann reports a metastasis in the vagina, showing the structure of atypical chorioma, but it is possible that the original condition was one of deported villi, whose cells underwent this form of regression. It is doubtful if genuine progressive metastases ever occur from this type of chorioma.

Microscopically the structure is extremely characteristic. As detailed above, the growths consist of irregularly distributed groups and diffuse masses of large or giant syncytial wandering cells, whose minute structure suggests a form of degeneration with proliferation, cell fusion, obstruction and thrombosis of vessels, and necrosis. Definite syncytium, Langhans' cells, or villi, are missing, but Fleischmann pictures a few islands of rather typical syncytium among a large number of wandering cells.

Much of the bulk of these masses may be contributed by coagulated blood and fibrin mingled with pus, and by the infiltration of the muscularis and especially of the walls of dilated sinuses with wandering cells, exudate, and inflammatory cellular tissue.

The origin of these wandering cells, and their abundance in necrosing portions of malignant choriomata, explain the occurrence of transitional forms between pure atypical chorioma and choriocarcinoma or adenoma of which there are many examples in the literature, and in which one finds increasing proportions of well formed syncytium and of Langhans' cells. Processes which exhibit budding syncytium and Langhans' cells must be rigidly excluded from the present group.

The prognosis is essentially favorable. As the life span of the wandering cells is limited, this process advances slowly, it gives ample warning of its presence by considerable enlargement of the uterus and frequent hæmorrhages, it seldom perforates the uterus, and progressive metastases have apparently not been observed. Yet there are serious dangers connected with its course and many of these cases are fatal. In Schmauch's list about five per cent of the fatal cases were of this type. Hæmorrhage, local and general infection, peritonitis, and perforation during curettage, are the chief causes of death.

The treatment, assuming that the diagnosis is correctly established, must vary with the local and general conditions. This is the condition for which Menge has said that it is a crime to remove the uterus. Nevertheless, when the uterus has been removed it has usually been found to be so extensively invaded that it is doubtful if it could ever have been restored to a safe or physiological condition. Yet the numerous recoveries after curettage (Menge) show that this should be the first procedure in cases which are not too far advanced or too seriously complicated by hæmorrhage or infection. When the disease has greatly enlarged and extensively invaded the uterus, or when there are severe hæmorrhages, anæmia and cachexia, or grave infection, hysterectomy would seem to be the only adequate method of dealing with it.

The question remains as to the true pathological nature and position and a suitable nomenclature of this process. The term atypical chorioepithelioma has become established by several years of general usage, but it was introduced at a time when the exact pathological and clinical characters of the process were imperfectly recognized, and it can hardly be claimed that it meets the present requirements. These requirements are theoretical and practical. From the pathological standpoint one has here to deal with a peculiar process quite distinct in most instances from a progressive neoplasm, and differing widely from the more malignant forms of chorioma. There does not appear to be any parallel among pathological conditions for this peculiar limited but destructive proliferation of syncytial wandering cells. It has some of the characters of a productive inflammation which would be indicated by such a term as "syncytial endometritis," but when it displays qualities approaching the neoplastic or occurs outside the uterus this term becomes inadequate. Yet

to designate such a process as chorioepithelioma, however modified, appears to the writer a more palpable misnomer.

Practically the requirements for a specific term for this process are more urgent. A disease which exhibits highly characteristic gross and microscopical features, pursues a unique clinical course, carries a modified prognosis, and requires a specially adapted line of treatment, would seem in the interests of the patient to deserve a specific name.

In the absence of a wholly suitable term, the writer has become accustomed to think of the milder cases of this group as a form of *syncytial endometritis*, and he therefore suggests that the employment of such a term is preferable to the present usage.

For those cases in which the process shows more definite characters of a neoplasm, the term *syncytioma* has been employed and commends itself, for reasons which require consideration in some detail.

TRANSITIONAL SYNCYTIAL CHORIOMA. SYNCYTIOMA

Attempts to sharply subdivide and classify closely related pathological processes usually encountered difficulty from the occurrence of transitional cases intermediate between the definite groups. The occurrence of such transitional cases in the field of chorioma, while not affecting the validity of the plan of classification requires special notice, for it is in regard to this class of cases that much confusion has arisen.

The transitional cases of chorioma stand between choriocarcinoma and chorioadenoma on the one hand and syncytial endometritis on the other. It has already been noted that in some cases of chorioma composed of both syncytium and Langhans' cells, the former cells greatly predominate, while the latter are relatively few in number and of reduced vitality. It is probable that there are all gradations between choriocarcinoma or adenoma and syncytial endometritis, and that the transition is marked by progressive increase in the proportion of syncytium and decrease of Langhans' cells, while at the same time the proliferating syncytium is gradually replaced by syncytial wandering cells. To what extent this transformation may occur in any given tumor is not clear, but it is reasonable to suppose, following the rules established for transplantable tumors in lower animals, that there are cyclic variations in the growth energy of choriomata, and that if favorable factors such as partial removal or improvement in health intervene at the periods of growth depression, some of these tumors may spontaneously regress, the regression being marked by the morphological changes above described. Numerous reports of the conditions under which such regressing choriomata are observed seem to require the admission that some of these tumors may progress for a time and then losing the power of further development undergo a process of regression marked by the overproduction of syncytial cells and degeneration of Langhans' cells. If examined histologically during the period of regression such a tumor would be found to have produced lesions which it would have been impossible of causing in its observed histological form, and such a tumor would prove less malignant than would be expected from the extent of its growth, and the structure or portions of the tumor.

It seems to the writer that the conception of partial regression of uterine choriomata is required by the clinical observations in this field, for in nearly all the cases in which the clinical course was said not to accord with the histological structure that structure has shown the features of transitional syncytial chorioma, indicating partial regression.

v. Velits has submitted to careful analysis many of the cases of unexpected recovery from chorioma after partial removal of the tumor, (Marchand, Kolomenkin, Noble), or after curettage, or spontaneous expulsion of a uterine tumor, and shown that nearly all these cases showed histological signs of partial regression.

The relatively favorable prognosis of choriomata of the syncytial type is also clearly apparent in Schmauch's analysis. It is difficult to determine just what forms of chorioma are subject to the regressive changes designated as transitional or syncytial chorioma. It is evident that some of the cases showed many of the features of choriocarcinoma, since villi were absent and syncytium and mitotic Lang-

hans' cells abundant. Yet the writer is strongly of the opinion that the change rarely if ever affects in pronounced degree the highly malignant choriocarcinomata with extensive metaplasia of Langhans' cells and syncytium, and that it is practically limited to the chorioadenomata. Some of the reasons for this conclusion are as follows:

The gross, microscopical, and clinical features of chorioadenomata closely approach those of syncytial chorioma. In the gross chorioadenoma produces local or pulmonary but not general metastases. In structure chorioadenoma usually shows a preponderance of syncytium and if one eliminates the stroma of villi it is a short step from the complete picture of chorioadenoma to syncytial chorioma. Chorioadenoma possesses only moderate malignancy, sometimes regressing after partial removal (cases, Zajorganski-Kissel, Kworostansky, Lonnberg, Mannheimer, Neumann-Schauta). It therefore belongs to a type of tumor which, like syncytial chorioma, displays a tendency toward spontaneous regression. In fact the writer would class many of the cases reported as syncytial chorioma in the group of chorioadenoma without villi.

On the other hand, the gross, microscopical, and clinical features of true choriocarcinoma differ sharply from those of syncytial chorioma, and the common behavior of choriocarcinoma does not favor the belief that it may ever spontaneously regress. Yet regressive changes occur in some portions of highly malignant choriomata, and it does not seem possible by an analysis of the literature to determine the exact limits of the occurrence of pronounced transitional changes in chorioma.

It remains an open question whether the occurrence of transitional cases does not deserve to be emphasized by the formal classification of these cases in a fourth group of choriomata. Several considerations seem to weigh against such a plan. Slight regressive changes occur in some parts of the most malignant choriomata without affecting the prognosis. The occurrence of regressive changes does not constitute a specific histological type which alone can form a legitimate basis for the classification of tumors.

Different degrees of regressive changes influencing the prognosis affect both the well defined types of chorioma, so that a new group created on this basis would not exclude the others. The terms syncytial chorioma or syncytioma therefore seem to find a place in designating certain regressive changes occurring chiefly in chorioadenoma, which are of much practical importance in prognosis.

BIOLOGICAL PECULIARITIES OF CHORIOMATA

That the clinically significant features of tumor growth are often determined by the physiology of their cells of origin is nowhere more conspicuous than in the group of chorioma. The unique physiological position of the chorionic epithelium is paralleled by several remarkable features in the tumors derived from these cells, which it is of interest and importance to consider in some detail. Moreover, the evidence bearing on some of these peculiarities is rather fragmentary and inconclusive so that it seems desirable to consider at this time what one can believe regarding some of the distinguishing qualities of choriomata.

(*a*) *The deportation of normal chorionic elements and their fate.*

That syncytial masses are often carried from the uterus and lodged in the pulmonary and other capillaries was first shown by Schmorl for cases of eclampsia and later for normal gestation. Such emboli are commonly recognized to some extent in the lungs of most subjects dying during gestation. Schmorl found them in eighty per cent of 158 cases.

Most of the emboli consist of single syncytial masses which exhibit as a rule signs of absorption by the pulmonary cells. In this form they are not always to be distinguished from other embolic cells, especially those derived from the bone marrow, but there is no doubt that deportation of syncytial masses occurs in probably all normal gestations and often at an early period. Lately, however, Schmorl has somewhat informally stated, and his pupil Dunger (l. c., p. 340) has substantiated him more fully, that portions of whole villi including the stroma may occasionally be found in the pulmonary and pelvic vessels. This event occurs only when considerable force has been employed in the delivery.

This observation I believe has not yet been confirmed, but the possibility of its occurrence suggests a cause for some of the pulmonary thromboses of parturition.

Occurring in all pregnancies, the usual fate of such deported cell masses must be absorption, but in two cases of abortion and in three of simple hydatid mole, Dunger described proliferative changes in the embolic cells. In some cases the proliferation was recognized by a comparison of the embolic cells with those found in the uterus, a method of judgment which is perhaps somewhat uncertain, while in other cases the cells seemed to be breaking through the wall of the occluded vessel.

Schmorl believes that transitory proliferation of embolic syncytium occurs rather frequently in the lung, and he describes small cicatrices in this organ which seemed to have resulted from the final absorption of such groups of cells.

If these observations are reliable then it would appear that epithelial cells from the normal chorion or from moles which completely regress after expulsion are sometimes capable of multiplying and growing in the lung.

That this capacity is not limited to placental cells is shown by the old experiments of Conheim and Maas, who constantly saw proliferation followed by regression of rabbit's periosteum injected into the jugular vein and lodging in the lung.

That benign moles may give rise to benign metastases is further shown by an observation of Pick's, who in a case of simple hydatid mole found a vaginal tumor containing a dozen segments of villi with hyaline stroma and syncytium largely necrotic. The outcome of this case was not known, but Pick based a favorable prognosis on the degenerated state of the cells.

These observations on the frequency and extent of deportation of chorionic structures throw new light on the significance of metastases in choriomata; especially on the occurrence of benign metastases. They emphasize the fact that the occurrence of such metastases is not necessarily a grave event.

(*b*) *Can malignant tumors develop from the deported normal or originally harmless cells of the chorion and placenta?*

The discovery of increased proliferative powers of embolic cells derived from simple moles and the placentas of abortions raises the question how far may such proliferation go. Pick thinks that a harmless uterine mole may give rise to metastases and these later turn malignant. He bases this view on the observation of regressing villi in a vaginal tumor, and on the claim that the histology of vaginal metastases which regress and those which prove malignant may be identical. He refers to Apfelstedt's case in which vaginal metastases that proved malignant had the same histological structure as others which were known to have regressed. But in Apfelstedt's case both the uterine tumor and the vagina metastases had the structure of chorioadenoma, not that of normal villi, and there is no indication that the metastatic cells in this case developed malignant qualities after lodging in the vagina. It may be granted that embolic cells of these, as of other tumors, show increased powers of growth but there is as yet no histological proof that the embolic cells of normal villi or of simple hydatid mole may become malignant. Schmorl reports a case of malignant choriocarcinoma in the organs, appearing first in the vagina, developing eighteen weeks after normal pregnancy with a normal uterus. Although the placenta in this case was not examined, Pick claims that this case proves that a malignant tumor process may appear first in embolic cells McCann reports a case in which the disease was said to have arisen nine years after the last normal labor, yet an abortion occurred only three months before. The presence of a normal uterus does not exclude the possibility of chorioma developing in an ectopic sac as has occurred in thirteen reported cases. The above references form the basis of the view that malignant chorioma may develop in the organs from embolic normal cells while the uterus remains free. It is obvious that the proof of such an event is defective. Schmorl inclines to doubt such a possibility, and since the placentas were not examined in the suspected cases he thinks that a partial mole must exist before an ectopic chorioma can develop. That partial hydatid degeneration is very common is shown by Stoerk who reports that four-fifths of abortive placentas show such changes. In a

series of abortions examined by the writer, hydropic degeneration of the villi was always present but proliferation of cells was usually slight. In none was there any definite tumor process in the villi. Since malignant chorioma has repeatedly occurred after normal labor at term, andw hen thus arising has an unusually bad prognosis, and since it is very unlikely that a malignant mole can leave the uterus entirely free, it must be admitted that there is a suspicious set of circumstances suggesting that highly malignant chorioma may develop from deported normal placental structures. Marchand has practically accepted this conclusion. It may be suggested that this entire subject of the fate of deported placental structures is open to experimental investigation. At present the experimental data offer no support to the alarming conception that the pregnant woman may fall a victim to emboli of normal cells. The occurrence of chorioma of teratomatous origin must also be considered in these cases.

(*c*) *Recovery from chorioma after occurrence of pulmonary metastases.*

In 1905 Fleischmann collected seven cases of recovery after the probable occurrence of metastases in lungs as reported by Chrobak, v. Franquè, Zagorjanski-Kissel, Ladinski, Neumann-Schauta, and Pestalozza. The evidence of pulmonary metastases consisted in the symptoms of cough and hemoptysis. While the lungs were necessarily not examined histologically and no tumor fragments were found in the sputum, there seems to be no reasonable doubt that in these cases cell emboli occurred and were eventually absorbed. This conclusion has been rendered more acceptable by what has since been learned about pulmonary emboli from the normal placenta and of their usual fate. Yet it is possible that some of the emboli consisted only of fibrin.

That recovery may follow the development of vaginal metastases is clearly shown by the list of thirteen such cases collected by Schmauch. To these may be added two similar cases reported by Neumann and Kolomenkin. In some of these the uterus and vaginal nodules were removed, in others only the uterus was removed, while in the cases of Fleischmann, Hörrmann, and Kolomenkin neither uterus nor vaginal nodules were completely extirpated.

It is therefore evident that neither pulmonary nor vaginal metastases carry a necessarily fatal prognosis, although it should be emphasized that the great majority of patients with cough and hemoptysis die. The gravity of vaginal metastases is considerably the less serious, and the occurrence of quite harmless vaginal emboli of cells and villi should be kept in mind.

It is in this field of vaginal metastases that much conflict of opinion has arisen regarding the value of histological examination of the excised tissue. Yet the writer finds that a study of these case reports clearly indicates that pulmonary and vaginal metastases of favorable course belong to the group of chorioadenoma or syncytioma and not to choriocarcinoma, and that histological examination is of much value as a guide to prognosis. Thus in fifteen such cases I find that in nine villi were present, in three (Fleischmann, Kolomenkin, Hörrmann) the growth was atypical, in two the description is indefinite. Yet in Schlagenhaufer's case the structure was possibly that of choriocarcinoma, although syncytial cells were very abundant and extremely vacuolated as in chorioadenoma, and the nodule was small. The uterus was normal.

(*d*) *Recovery from chorioma after curettage.*

In 1904 v. Velits collected eight cases of chorioma in which curettage was followed by recovery. I have examined the reports of these cases and find that in five, masses of proliferating Langhans' cells were absent and the growth was composed chiefly of large wandering syncytial cells. These five cases therefore fall in the group of syncytioma or syncytial endometritis, for which Menge recommends curettage as the operation of choice. Of the remaining cases Risel's and Blumreich's were hydatid moles with active proliferation of cells — doubtful chorioadenoma. Graefe's case was inadequately described.

Here again the histological examination gave reliable indications of a tumor of moderate potential malignancy. That curettage is an unsafe measure in dealing with true tumors of the chorion is shown by the high mortality accompanying curettage, even when promptly followed by hysterectomy. The gross anatomical conditions, existing with choriocarcinoma

or chorioadenoma are hardly favorable for complete removal of the growth by the curette.

(*e*) *Recovery from chorioma after partial removal of the uterine tumor.*

In cases reported by Marchand, Noble, Kolomenkin, Fleischmann, Hörrmann, Dunger, Cazin-Segond, the patient recovered after operation, although the tumor was not completely removed. In the cases of Fleischmann and Cazin-Segond the growth contained only syncytial wandering cells. In the cases of Marchand, Kolomenkin, and Hörrmann masses of proliferating Langhans' cells were missing and the tumors are difficult to classify, but were chiefly of syncytial nature. In Dunger's case there was recovery after early hysterectomy for chorioma, but a vaginal tumor arising later and of undetermined nature spontaneously regressed. The case is apparently similar to that of Schlagenhaufer, and points to the possibility that an isolated metastasis of choriocarcinoma may spontaneously regress. In the recent work on the transplantation of tumors in mice it has been possible to distinguish between a premetastatic and a metastatic period. In the cases above cited, one may suppose that the organism was susceptible to the growth of the original tumor but insusceptible to the implantation of metastases. In Noble's case, the size of the tumor, 8 x 8 x 7½ cm., indicates that it did not belong to this more malignant group of choriomata, while the structure showed a preponderance of syncytial cells, and islands of Langhans' cells appear to have been missing.

(*f*) *Primary ectopic chorioma.*

The occurrence of primary ectopic chorioma with the uterine mucosa free from involvement was first observed by Schmorl after normal labor and by Pick after an hydatid mole. Pick drew the conclusion from these cases that embolic cells of a harmless mole might develop a metastatic tumor, while Schmorl inclined to the opinion that such ectopic choriomata must be metastases from an original intrauterine tumor.

In 1902 Zagorjanski-Kissel collected sixteen cases of primary ectopic chorioma, to which may be added Dunger's case and that of Davis and Harris. Five of these (Schmorl, Fiedler, Lindfors, Wehle 2) occurred after normal labor and were fatal (choriocarcinoma). Since the uterus was normal or showed only moderate changes it is difficult to escape the conclusion that the tumors arose from deported normal cells. Yet, as the placenta was not examined it remains possible that an early tumor process existed in the placenta before expulsion. Marchand's fatal case of ectopic chorioma was preceded by hydatid mole and presented the structure of choriocarcinoma.

Seven of the eighteen cases recovered, three of the type of chorioadenoma (Zagorjanski-Kissel, Schmit, two cases): one with predominance of syncytial cells (Guerard); and one the anomalous case of spontaneous recovery from vaginal choriocarcinoma (Schlagenhaufer). In Holzapfel's case the structure was not detailed, while in Pick's case the deported villi were degenerating and probably not of neoplastic nature. Eleven of the eighteen cases were fatal, with general metastases, and actively proliferating syncytium and Langhans' cells.

In this group of cases the relatively favorable prognosis of chorioadenoma and the unfavorable significance of the structure of carcinoma with proliferating Langhans' cells, reappear. The grave prognosis attaching to cases arising after normal labor is also supported by five of this group, all of which were fatal.

Tubal pregnancy has given rise to chorioma in thirteen reported cases (Marchand, Snegi-new, Nikiforoff, Thorn, Rosner, Gebhard, Albert, Hinz, two cases; Senarcleus, Vasmer, and Risel). Twelve of these were collected by Risel and to his list has since been added one case by Garkisch.

All of these were fatal except Albert's case, and all presented the structure of choriocarcinoma or adenoma.

Senarcleus reported his case as atypical but yet describes many mitoses in small clear cells, together with syncytium.

The diagnosis of tubal chorioma was based upon the presence of a large tumor distending the tube or broad ligament and lying wholly outside the uterus, while the uterine mucosa was unaffected.

Ovarian pregnancy seems to have been the origin of the fatal choriocarcinoma described by Kleinhans.

(*g*) *Chorioma of teratomatous origin.* In dealing with primary ectopic chorioma one must consider the possibility that the tumor may be of teratomatous origin and wholly unconnected with pregnancy. In the male subject many cases of generalized chorioma are recorded as secondary to primary teratoma of the testis. In a few instances, as in that of Bostroem, tumors of the same character have not been traced to the testicle and their site of origin remains obscure. In the female also a few cases of chorioma have been described as occurring under conditions which seem to preclude the possibility of pregnancy. Such a case is that of Lubarsch, who observed an abdominal chorioma in a virgin of thirteen and a half years, who had never menstruated. Other cases of chorioma in the female probably not connected with pregnancy are reported by Pick and by Bock.

With few exceptions the cases of primary ectopic chorioma in the female have been clearly derived from an ectopic pregnancy and a definite gestation sac or a uterine pregnancy were demonstrated, but in a few cases this connection has not been conclusively shown. In the absence of other unmistakable evidence of pregnancy chorioma may have to be referred to a teratomatous origin.

(*h*) *The general prognosis of chorioma.*

The high mortality of chorioma and the relation of the mortality to the preceding condition is well shown by Teacher's statistics.

Preceding Condition	Total	Deaths	Recoveries	Percentage of Recoveries
Hydatid Mole	73	39	34	46.6
Abortion	59	38	20	33.9
Labor at Term	49	39	10	20.4
Tubal or Ovarian	7	5	1	....
Total	188	121	65	34.2

In these 188 cases radical operation was performed 99 times with 63.6 per cent of recoveries. After operation recurrence was noted within six months or not at all, except in five cases. In one case (Loblein) recurrence was postponed for one year. The high mortality in cases following labor at term is very striking.

The relation of mortality to histological structure I have endeavored to trace in the cases collected by Schmauch, but it is often difficult to determine the exact structure from the histological report of the authors. In 108 fatal cases 79 (73 %) may be classed as choriocarcinoma. By the same criteria out of 94 recoveries 17 (18 %) belonged in this same group. In most of these it is difficult to determine just what histological signs of malignancy and metaplasia existed, but many of them showed a marked preponderance of typical syncytium and relative deficiency of proliferating Langhans' cells.

Of 65 fatal cases with general metastases collected by Schmauch all showed the structure here designated as choriocarcinoma. Among the fatal cases with metastases limited to the lungs and vagina are many in which syncytial cells were the predominating form and Langhans' cells deficient, and several chorioadenomata occur in this group.

While there are recorded many fatal cases of chorioadenoma or atypical chorioma (infiltration by syncytial wandering cells) in reviewing the histories of these cases one must be impressed by the frequency with which hæmorrhage, infection and cachexia, and not the progressive growth of the tumor, prove to be the cause of death.

There is thus a very definite relation between the histological structure of these tumors and their clinical course. While this relation is not so uniform with chorioma as with some other forms of carcinoma, yet it appears too obvious to justify the extravagant statement that histological examination gives no indication of the future course of the disease. I believe that the recognition of the three classes of tumors here suggested, choriocarcinoma, chorioadenoma, and syncytial endometritis or syncytioma, would further the establishment of a definite potential malignancy for each group.

In considering the prognosis of any malignant tumor one must distinguish between potential malignancy and clinical course. The potential malignancy can be accurately judged only

by the histological structure, but the clinical course is subject to great variations from external factors which are unrelated to the potential malignancy. Many early but highly malignant cancers of the tongue, uterus, and breast are cured by operation. There is an increasing list of spontaneous recoveries from highly malignant tumors, while the spontaneous regression of certain partially removed ovarian adenocarcinomata is the rule. If the histological structure of the regressing choriomata were more carefully compared with that of the progressively fatal ones and exact standards of histological malignancy were employed, I believe that it would be found unnecessary to except chorioma from the general rule of a clear relation between structure and prognosis.

BENIGN CHORIOMA

An active discussion has been carried on by v. Velits, Meyer, and Hörrmann regarding the possibility of recognizing a benign form of chorioma.

v. Velits maintained that it is possible to recognize histologically those tumors which will progress favorably. The signs on which he relied are (1) absence of mitoses in Langhans' cells; (2) signs of degeneration in these cells and in syncytial masses, and (3) comparative or complete absence of Langhans' cells. Meyer goes much further and would recognize a malignant chorioma only in the presence of (1) invasion of the musculature by thick masses of cells; (2) a considerable proportion of Langhans' cells in active mitosis; and (3) leucocytic reaction, necrosis, and thrombosis. In studying the pregnant uterus in pathological conditions associated with placental retention he found a bulky growth of epithelium well within the musculature but without active mitosis in Langhans' cells or leucocytic infiltration. He states that as long as villi are found the discovery of epithelium deep in the muscle or even breaking through the vessel walls may signify a harmless cell invasion and should suggest placental retention rather than a malignant tumor. In such cases he would wait three weeks for a second curetting in order to determine the existence of a persistent tumor process.

Hörrmann attacks all these conclusions of v. Velits and Meyer. In a case he reports, mitoses in Langhans' cells were very abundant and yet the patient recovered. He concludes that chorioma in the musculature loses its characteristic cell types because the Langhans' cells lose their vitality or cease multiplying altogether. Langhans' cells, he thinks, are not necessary for the picture of malignant chorioma, and syncytial wandering cells are by no means harmless elements when found alone in these tumors. He goes so far as to say that complete absence of Langhans' cells means nothing for prognosis, while their appearance in compact masses does not indicate malignancy, since he saw such masses in a case which spontaneously recovered.

As a comment on this discussion one may point to the above statistics, which show that tumors of the type of choriocarcinoma are almost always if not invariably fatal, that a considerable proportion of the type of chorioadenoma, and a still larger percentage of transitional cases recover, some of them spontaneously, while with syncytial endometritis curettage, according to Menge, is the operation of choice. It should be noted that Hörrmann based his conclusions on the examination of curettings, while Meyer reports a study of the whole uterus. Two curettages cured Hörrmann's case in spite of an unremoved vaginal metastasis, a result which was foreshadowed by the evident signs of regression in the tumor, syncytial chorioma, infiltration of the muscle only by wandering cells, and freedom of the sinuses from tumor masses. Langhans' cells may be absent in some fatal choriomata, but contrary to Hörrmann they are universally recognized as an essential element in the highly malignant tumors.

v. Velit's signs of reduced malignancy, especially the predominance of atypical regressing syncytium, and comparative or complete absence of Langhans' cells have been commonly accepted as belonging to tumors of low potential malignancy with a regressing tendency, but their existence does not assure that the patient will escape all the accidents belonging to such conditions.

None of the above writers seems to have considered the histological signs indicating the degree of cellular metaplasia, yet these become very distinct in the more malignant tumors and furnish a most reliable prognostic criterion. However difficult it may be to recognize the favorable cases, most of the definite choriocarcinomata present unmistakable histological signs of great malignancy. (See case 6.) Fig. 12.

The element of individual resistance has justly been given a very prominent place among the factors determining the prognosis of chorioma. There is clinical and experimental evidence that hæmorrhage, infection, cachexia, and the pregnant state exert a pronounced

influence on the growth of tumors and the development of metastases. Zajorganski-Kissel especially has emphasized the importance of this factor in chorioma, and would even attribute to it almost exclusively the determination of the course of these tumors. Yet it has never been shown that any constitutional condition sharply influences the inception of tumors or their original potential malignancy, and it appears very doubtful if the constitutional element exerts any greater influence on chorioma than upon some other tumors. Cancer of the breast arising in pregnancy usually shows a malignancy quite equal to that of the most rapid chorionic carcinoma.

When one considers the brief life span and unusual forms of growth of the chorionic epithelium and the complicating factors of gestation, anæmia, and sepsis, it would seem that a sufficient explanation were furnished for all the observed clinical peculiarities of choriomata. If any peculiar factor is present in this group of tumors it is in the writer's opinion to be found in the relations of lutein secretion to the chorionic epithelium.

(*i*) *Relation of corpus luteum secretion to chorioma.*

Although Wilton, in 1840, described cystic changes in the ovaries in a case of malignant hydatid mole, and many have since reported similar cases, only in recent years has any reasonable hypothesis been offered to explain this combination of lesions. In 1895 Marchand pointed out the notable frequency of ovarian cysts with chorioma. In 1901 Stoeckel showed that many of these cysts are developed from corpora lutea, and are accompanied or preceded by a more or less diffuse infiltration of the ovary with lutein cells from which the multiple cysts probably arise. So extensive was this infiltration that Schaller-Pförringer considered the possibility of its cancerous nature. Many details of the structure of the cysts were given by Fraenkel, Orthmann, and Jaffe. In 1903 Fraenkel concluded from experiments on animals and clinical observation that the function of the corpus luteum is concerned with the implantation and growth of the fertilized ovum, and that such implantation fails to occur when the corpus luteum is excised. Frankel thought that death of the ovum, hydatid mole, and chorioma might result from interference with the function of the corpus luteum.

At the same time Pick suggested the theory that the corpus luteum secretes a specific nutritive substance which presides over the growth of the ovum, and that an excess of this secretion may be responsible for the excessive growth of cells in malignant chorioma.

Seitz, Grouzdew, and Wallert, have doubted the importance of the relation of corpus luteum cysts and chorioma.

Seitz, in an extensive material, traces the origin of the cysts to the atresic follicles of the ovary and endeavors to prove that the hyperplastic cells of these follicles are of quite different significance from those of the true corpus luteum with which Fraenkel's experiments were concerned. He finds that the atresic follicles begin to hypertrophy in the sixth week of normal pregnancy and progress until term. He doubts the dispersion of lutein cells throughout the ovary and considers that stroma cells give rise to the islands of tissue resembling lutein cells. He thus draws a sharp distinction between cysts of true corpora lutea and the polycystic condition of the ovaries in gestation and hydatid mole. He claims that there is no important distinction between the polycystic condition in normal pregnancy, mole, and chorioma, and ventures to state that the size of the cysts in chorioma is of no great significance, since the larger the cysts the less is their content in lutein cells. The great size of the cysts in chorioma he refers to mechanical factors, as venous congestion from adhesions, chronic nephritis, etc.

Wallert observed that hyperplasia of the cells of the internal layer of the corpus luteum is characteristic of pregnancy, and found that cysts of this type occur without hydatid mole or chorioma. He collected several cases of pregnancy without moles or chorioma, in which cysts were almost as numerous and large as he found in a certain case of chorioma. He reports one case of fatal chorioma with small ovaries, but the report shows in one ovary cysts of the size of a cherry.

Dunger, a pupil of Schmorl's, regards the ovarian cysts as a secondary effect of the active growth of chorionic cells and classes them with

hypertrophy of the breast and other nutritional changes of pregnancy.

Nevertheless the primary importance of ovarian secretion in chorioma and the theories of Fraenkel and Pick have not been disposed of. The minute studies of L. Fraenkel, Stoeckel, Orthmann, Pinto, Jaffe, and others, leave no room for doubt that the cysts arise from corpora lutea, vera, and spuria, and from disseminated islands of lutein cells, as well as from atresic follicles, and that however arising they contain lutein cells in great excess. According to the character of the lining cells the cysts fall into four classes, which represent transitions of essentially the same structure: (1) Cysts lined by hypertrophic lutein cells. (2) Cysts lined by connective tissue in which the original epithelial lining has been lost. (3) Cysts lined by connective tissue covered by flat or endothelial cells. (4) Cysts lined by lutein cells covered by cylindrical, cuboidal, or flat epithelial cells.

In normal pregnancy somewhat similar but much less extensive hypertrophy of lutein tissue occurs, but, as Seitz admits, these changes are limited to pregnancy, hydatid mole, and chorioma. A pronounced degree of the characteristic changes is practically limited to hydatid mole and chorioma.

The association of advanced polycystic degeneration of both ovaries with hydatid mole and chorioma is very frequent if not invariable. In 1905 Patellani reported that in 68 fully described cases of chorioma to that date bilateral cystic changes in the ovaries occurred in 62, or 91 per cent.

That early cystic changes may readily be overlooked was pointed out by Jaffe, and is shown by the writer's experience in his case 7. Here the ovaries in the gross appeared entirely normal, but on section they were found to be riddled with small cysts. Some of these were cysts of atresic follicles with hypertrophied lining cells; others were cysts of old corpora lutea in many stages and showed much hypertrophy of the large epithelioid cells. Considerable areas of the ovary contained groups of these epithelioid cells as described by Stoeckel, and their total bulk greatly exceeded that found in normal pregnancy. This observation shows that cases in which the ovaries have not been examined microscopically for this particular purpose must be eliminated from the present discussion. Moreover, it is obvious that a hypersecretion may exist in ductless glands without the formation of cysts, and we have yet no method of determining the activity of ovarian secretion.

Judging by analogy with other ductless glands, as the thyroid, or the islands of Langerhans, an excessive secretion and its associated histology in one subject might be deficient for the needs of another organism, while the influence of the age of the patient, the number and period of the pregnancies, and other individual pecularities, must determine the requirement and influence the course of ovarian secretion.

While Seitz' admirable observations have succeeded in demonstrating that the chief origin of the multiple cysts may be from the atresic follicles, his argument that the condition in the ovaries in chorioma has no other significance than that of a slightly exaggerated normal process is plainly defective. The astonishing grade of cystic degeneration common with chorioma is not duplicated in any other condition, and mechanical factors cannot be held responsible for such extensive changes. Chronic congestion does not produce ovarian cysts, while very extensive grades of cystic change occur when the uterus is but slightly enlarged (see Fig. 10). Contrary to Seitz' surmise the bulk of active lutein tissue in the average case of chorioma enormously exceeds that of normal pregnancy. His chief argument is based on the supposed difference in origin and function of the lutein cells of the corpus luteum and the hyperplastic cells of the atresic follicles. Yet the uncertainties surrounding the origin of the cysts and the relation of their lining cells cannot obscure the fact that the cysts once developed contain a great increase in lutein tissue. Wallert in a recent study has reached this same conclusion. On the point of origin of the cells in question, Seitz' view is by no means proven, and he admits that there are transitional cysts bridging the apparent gap between corpus luteum and the follicular type.

Dunger's idea that the cysts develop as a secondary effect in the general nutritional

changes of pregnancy is irreconcilable with the fact that advanced cystic ovaries are almost never seen in normal pregnancies. While it is said that bilateral cystic ovaries have been found without hydatid mole or chorioma, such cases are extremely rare and the identical character of the cysts may be doubted.

In view of these facts and of the occurrence of peculiar bilateral cystic ovaries in at least 91 per cent of the cases of chorioma, it is difficult to escape the conclusion that there is some essential connection between the two conditions.

What the nature of this relation may be is at present entirely obscure. An excess, or deficiency, or altered quality of ovarian secretion, might meet the demands of the Fraenkel-Pick theory. The subject invites experimental study as the method best adapted to furnish a solution of this interesting problem.

The importance of the subject, both in the field of chorioma and for the general principles of tumor growth, is obvious. If one could substitute for the complex conception of individual resistance the idea of varying quantities of a definite physiological principle, many of the obscurities in the field of chorioma would be cleared up, and perhaps the foundation laid for exact and effective practical procedures.

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CARCINOMA OF THE PANCREAS[1]

BY ALEXANDER HUGH FERGUSON, M. D., CHICAGO, ILLINOIS

IT is not my intention in this short paper to present all the literature nor all the phases of carcinoma of the pancreas. However, of all the new growths of the pancreas, carcinoma is the most common. It is usually primary, but may be secondary, extending from neighboring organs, especially from the stomach. When the disease is primary, the head of the pancreas is most frequently affected, involving the ducts and not rarely including the ampulla of Vater. When the portal circulation is obstructed, ascites ensues and the clinical picture will vary according to the particular part involved. The patient is usually middle-aged and complains of vague digestive symptoms accompanied sooner or later by loss of strength and weight. Jaundice develops gradually, usually accompanied by pain, but with steadily progressing intensity. Indistinct colicky attacks, sometimes simulating a gall-stone colic, obscure the clinical history. In spite of anything that can be done in the way of medication, the jaundice deepens in intensity until the skin assumes a dark greenish hue. Long before this occurs the gall-bladder is, as a rule, more or less distended, but by the time the jaundice is complete a tense tumor may be felt in the region of the gall-bladder. From this time on the clinical picture is that of a general distress, feebleness, lassitude, emaciation, progressing steadily downward. The stools are characterized by an absence of bile.

A pancreatic diabetes may be present, indicating that the glands of Langerhans are involved.

The principal condition from which carcinoma of the pancreas must be differentiated is chronic pancreatitis. A diagnosis is of the very greatest importance, on account of the gravity of the prognosis of carcinoma of the pancreas as compared with chronic interstitial pancreatitis.

There are two signs that are almost pathognomonic of carcinoma of the head of the pancreas. The first is marked jaundice and the second is a distinct enlargement of the gall-bladder. If the gall-bladder is contracted and jaundice is present, the obstruction is almost invariably due to stone. I have had one that I am sure was an exception to this rule. Courvoisier was the first to observe that dilatation of the gall-bladder always accompanied jaundice in this condition, and that it is invariably due to something else than stone. This axiom is known as Courvoisier's law.

The extreme rarity of sarcoma of the pancreas, which is always secondary and usually of the melanotic variety, needs only to be mentioned as a possible condition from which carcinoma must be differentiated.

In making a differential diagnosis of carcinoma of the pancreas, it must be borne in mind that whenever a patient past middle life develops jaundice which increases in intensity and becomes absolute, and at the same time the gall-bladder gradually enlarges to form a perceptible tumor, with the accompanying rapid loss of flesh and strength, carcinoma of the pancreas should be suspected. There are occasional exceptions to this rule, as was the case I mentioned above, and of which I will give the history directly.

The absence of tenderness over the lower right costal margin, together with the presence of a pulsating epigastric tumor, a tumor which does not move with respiration, tend to verify the diagnosis of carcinoma of the pancreas.

In cholelithiasis there is the history of gall-stone colic, jaundice, and sometimes fever. There are pain and tenderness in the region of the epigastrium, but there is, as a rule, no emaciation, at least not until later in the course of the disease. In cases of chronic pancreatitis there is a long history of trouble in this region, with loss of flesh — gradual, not abrupt, as in the case of carcinoma, and usually not appearing until late, long after the time usually given for the occurrence of this sign of carcinoma. The gall-bladder is seldom distended, except in the early cases. The Cammidge reaction is always characteristic of inflammation.

Cantlie, in his recent work on the stomach,

[1] Read before the Chicago Surgical Society, February, 1910. See discussion, p. 429.

intestines, and pancreas, reports fifteen cases of primary carcinoma of the pancreas occurring in forty-one hundred autopsies made at the Charing Cross Hospital in London. These figures are in accord with those given by other observers.

The tumor may extend and involve the common bile duct and the pancreatic ducts. It may extend upward and forward, causing pyloric stenosis with dilatation of the stomach, or the extension may be backward so that the vena cava is compressed, causing an ascites and œdema of the lower extremities.

Pancreatic carcinoma rarely occurs before the age of forty, although a few instances are on record where it was met with in children. The schirrus columnar cell type is the most frequent form of carcinoma met with in the pancreas.

The treatment of carcinoma of the pancreas is purely surgical, and it is very unpromising at that. Villar records two cases in which he successfully performed a partial pancreatectomy. Complete removal of the pancreas was performed twice by Francke. Carcinoma of the pancreas is most amenable to extirpation when the disease is in the tail or in the body of the organ, and not in the head. Ruggi successfully removed a carcinoma of the pancreas weighing twenty-three pounds through the loin. In all probability this tumor originated from the tail of the pancreas, at least the description of the case would lead one to think so. The patient recovered and was well for three months, when evidences of recurrence were noted and the patient died six months later.

In 1894 Billroth removed the pancreas and the patient recovered. In 1895 Cade removed a tumor from the pancreas of the size of a child's head, and the patient recovered. In 1892 Terrier removed a five-pound tumor from the pancreas, but the patient died. In 1901 Francke successfully removed the entire pancreas. Of sixteen patients operated on for removal of solid tumors of the pancreas, eight recovered. In 1907 Desjardins advocated the removal of the pancreas, and, if necessary, the complete removal of the duodenum, with partial excision of the stomach, cholecystenterectomy, gastroenterostomy, and other minor procedures. Such an operation is considered feasible by competent surgeons.

In exploring the pancreas the abdomen is opened through the right upper portion of the right rectus muscle, about an inch to the right of the midline. The pancreas may be reached through six different routes:

1. Through the gastrohepatic omentum, above the stomach, a route that is especially advised in cases of gastroptosis.

2. From below the stomach, through the gastrocolic omentum.

3. From below the transverse colon, raising up the great omentum and colon.

4. Through the peritoneum, over the left of the duodenum, directly over the head of the pancreas, exposing the anterior surface of this organ and its head.

5. By mobilizing the duodenum to the left, going through the peritoneum, which binds it down, thus exposing the anterior surface of the pancreas and the right lateral portion of the head of the pancreas.

6. The tail may be reached by going through the peritoneum above the splenic flexure of the colon.

There are two great dangers in operating on the pancreas: First, hæmorrhage; second, the pancreatic secretion making its escape and causing injuries to the surrounding tissues. The pancreas is so friable that great care must be observed in clamping or ligating its tissues.

One anatomical point must be remembered in all operations on the pancreas, and that is the point which gives most excellent drainage after the operation, the left costovertebral angle, which is approached from behind on the left. In all doubtful conditions of the pancreas where merely an exploration is to be made, the median incision is probably the best. This is indicated when there is doubt as to the nature of the affection, whether it is an abscess, inflammation without pus formation, lithiasis, cysts, or carcinoma. The incision is made in the midline, above the umbilicus. If this incision is not suitable, no hesitation need be felt in making another.

CASE. I now wish to report a case which presented some points of interest. There was no gall-bladder in the case; instead there was a small pouch about the size of a thimble, so that Courvoisier's law did not per-

tain in this case. This was probably due to the fact that the patient had suffered more or less from what was supposed to be cholelithiasis for many years, and the gall-bladder had evidently then become contracted. The carcinoma in this case was situated in the head of the pancreas. It involved the ampulla and it had extended into the duodenum. The patient's history was as follows:

Mr. S., seen on February 28, 1902, sixty-two years old, American, five feet seven inches in height, weighed 155 pounds when in good health. He had lost twenty pounds in twenty-one days. In 1864 he had typhoid fever. At that time he was salivated. He had had slight rheumatic pains in a few of his joints. His family history was negative. When I first saw him he was complaining of considerable distress in the region of the gall-bladder, with pain radiating into the back, and rather persistent. He did not call it an unbearable pain. There were no attacks of hepatic colic. His illness began suddenly with a gradually deepening jaundice, intolerable itching of the skin, increasing weakness, rapid loss of weight, gastrointestinal disturbances, such as anorexia, constipation, indigestion, and clay-colored stools. He complained most of the nervous disturbances, a great restlessness, with mental depression and insomnia.

His trouble began thirteen years before, in 1889, with symptoms of indigestion and hepatic colic. He had several attacks in two years. In 1897 he had a very severe colic, and, for the first time, was jaundiced, very distinctly so. He was ill for a month, but no diagnosis was made of his condition. In 1899 he had

Fig. 1. Anterior view, carcinoma of the pancreas.

Fig. 2. Posterior view, carcinoma of the pancreas.

hepatic colic, with jaundice and fever. His case was then diagnosed as one of gall-stones. On February 7, 1902, he had a severe attack of nervousness, but no colic and no jaundice. It came on while he was at work and the distress became so great that he had to be taken home in a carriage. As soon as he reached home, he had a severe chill, with fever and slight jaundice. He had not lost any in weight up to that time, and felt quite well, except for occasional moody spells. Inside of twelve days the jaundice was extreme. His condition gradually became worse and he was finally referred to me on February 28th, complaining of the symptoms already mentioned.

As to the findings in the case: There was first jaundice; second, he was morose, but very quiet; third, he was very much emaciated; fourth, his temperature was 101° F., pulse 98, respiration 20; fifth, the abdomen was full and tense, with the right rectus muscle much more tense than the left. A tumor mass could be felt in two places, over the gall-bladder, but rather indefinite, and over the head of the pancreas, and rather distinct. Both masses could be felt only by firm palpation and deep percussion. Deep percussion over the mass in the gall-bladder region rather indistinctly outlined the shape of the tumor, but the gall-bladder itself could not be felt. There was distinct enlargement of the liver, and it extended upward rather than downward, above the right nipple. Tympany was general.

The other organs appeared to be normal. He passed fifty-six ounces of urine in twenty-four hours. The urine previous to this time had been very scanty. Specific gravity was 1008; .6 per cent urea, with albumin, bile, and every variety of cast; no sugar. The Cammidge test was not made. The stools were clay colored, but were not otherwise examined. The blood was negative as far as the cells were concerned, but it contained bile. A diagnosis was made of cholelithiasis and pancreatitis, and operation was advised.

As soon as the abdomen was opened, extensive adhesions were met with in the region of the gall-bladder, adhesions of the omentum, which was gathered together like a ball. It was adherent to the large bowel, stomach, liver, and anterior abdominal wall. This was the indistinct tumor that had been previously felt in the region of the gall-bladder. The adhesions were broken down and it was then that the small diverticulum previously mentioned was found in the position of the gall-bladder. This was opened and about one pint of a clear fluid was evacuated.

The liver was drained by a tube passed into the hepatic duct, and the abdomen was closed in the usual manner. The patient was transfused and put back to bed. He died on March 4th, on the fifth day after the operation.

The post-mortem disclosed a carcinoma of the head of the pancreas, with extreme dilatation of the ducts and absence of the gall-bladder. At the time of the operation the liver was split up in all directions, with the hope that a latent gall-bladder would be found, but the search proved futile.

The examination of the tissue taken from the liver, common bile duct, stomach, duodenum, pancreas, heart, kidneys, and lungs was entirely negative except for the finding of carcinoma in the head of the pancreas.

Fluid. Microscopic examination showed few leucocytes, moderate number of yeast cells, debris. Direct smears for bacteria, negative. Culture for bacteria, agar, and blood serum, negative. Agar and blood serum inoculated gave a colon bacillus. Starch added and placed in incubator. Result: No starch by iodine. Copper reduction with Fehlung. Conclusion: Complete reduction of starch.

Mixed with albumins, no trypsin action. Alkalinized and mixed with fat, put in incubator, found to be acid. Treated for fatty acids, fatty acids present. Steapsin action. Conclusion: The fluid contains pancreatic ferments.

Specimen. Gross description: The hepatic duct was widely dilated, measuring 2.5 cm. in circumference. At the point of attachment of the cystic duct was a large ragged hole. (Fig. 1.)

The common duct measured 3 cm. in circumference. It can be traced to the duodenum. Just before entering the duodenum it is joined by the pancreatic duct. These two ducts are pushed to the right by the large tumor mass in the head of the pancreas. They empty by a very minute opening in a sulcus between the mucous membrane of the duodenum and the eminence made by the tumor.

The pancreatic duct is widely dilated. Its circumference is 3 cm. The dilatation extends to the tail. In the region of the head the duct curves around the tumor mass, joining the common duct as already noted.

At the head of the pancreas is a large tumor mass. This originates below the pancreatic duct. It produces some pressure on the last cm. of the duct, compressing it and displacing it as already noted. The tumor has opened into the duodenum. (Fig. 2.) The large hole is about 6 cm. in diameter. Sections were made from this mass for microscopic examination. The omentum, mesentery, and tumor were bound together in a mass.

Microscopically. The sections show an alveolar carcinoma. The percentage of cells is large. The cells are rather small and rounded, not small for pancreas cells, but smaller than the cells of the duodenum or liver.

The stomach and duodenum present no points of interest, other than those already noted.

The heart has no bearing on the case. The kidneys, lungs, and other internal organs seemed normal. (Columbus Medical Laboratory.)

THE GROWTH OF THE BONE AGAINST RESISTANCE[1]

With Presentation of Case

By NORMAN KERR, M. D.
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THIS paper is more or less supplementary to the one read before the Chicago Surgical Society, April 6, 1906, on Osteoplasty, in which a patient, a boy ten years of age, was presented (and he has now kindly presented himself) from whom the writer removed the diaphysis, lower epiphysis, and about one-third of the upper portion of the astragalus on account of extensive osteomyelitis of a month's duration, and after infection was controlled implanted the lower end of the fibula onto the upper surface of the astragalus, and a month later performed arthrodesis of the superior tibiofibular articulation.

Quoting from the above mentioned paper, it says, "the principal point in this case and the one which is believed to be of value in properly selected cases, is the substitution of the fibula for the tibia as the pressure bearing bone, in order that continued growth in the

[1] Read before the Chicago Surgical Society, February 1910. See discussion, p. 429.

Fig. 1. Taken between Dec. 12, 1905, and Feb. 1, 1906. Amount of osseous tissue in regenerating tibia.

length of the leg may be maintained," and quoting further, "the time since the operation is entirely too short to prove absolutely whether

Fig. 2. March 9, 1906. After third operation. Showing lower end of fibula placed on remains of astragalus, also periosteum detached from fibula to act as support.

the fibula will continue to grow in length as fast as its fellow but the writer believes that it will." Quoting still further, "another advantage of this line of treatment properly carried out, is the great saving of time because as soon as suppuration has ceased the double osteoplasty described later can be performed and the patient allowed to walk as soon as he could after being treated for a compound fracture say, six or eight weeks." A suggestion was made at that time that just as soon as suppura-

Fig. 3. Showing how completely the shaft of the tibia has been regenerated from periosteum alone.

tion was controlled, the lower end of the fibula be placed on the astragalus and arthrodesis performed on the upper tibiofibular articulation at the same sitting, because in this case, the upper end of the fibula was 1 cm. nearer the upper edge of the tibia than in the normal leg on account of the weight being thrown upon the ligaments about this joint. This amount of displacement occurred in one month's time in January, 1906, and he was confined to the bed for the first half of the month. There was also considerable increased motion in the

Fig. 4. Taken Feb. 11, 1910. Note the small amount of posterior curving in lateral view; also the small amount of outward curvature in front view as compared with the usual deformity, after extensive osteomyelitis of tibia.

left superior tibiofibular articulation. This made a difference of 3 cm. in the length of the two legs at that time and the difference on March 30, 1909, was the difference between 35.5 cm. and 32.7 cm., which is less than 3 cm., but this discrepancy may be accounted for by reason of the increased motion in the left superior tibiofibular joint on February 1, 1906, and the measurement was probably taken when the bone was displaced upwards as much as possible. On March 30, 1909, the distance between the top of the right fibula and top of the tibia was 2.5 cm., while the left was only 5 cm. less, viz., 2 cm.

It will be readily understood that inasmuch as the lower epiphyseal line of the left tibia was totally destroyed and if it contributes one-fourth to the growth in length of this bone that the fibula would encounter considerable resistance in forcing the new tibia without its lower epiphyseal line to contribute its part in the function of growth; to grow as fast as its fellow. The hope expressed in the first report seems to have been for the most part at least, realized at this time, March 30, 1909, a little over three

years and now nearly four, during which time the growth in the non-interfered with fibula has been 3.5 cm. in length, and if this continues until the patient attains his full growth, he will have avoided several severely crippling deformities, viz., much greater shortening, a talipes varus, and possibly one or both annoyances incident to the displacement upward of the upper end of the fibula, or the pain which accompanies the varus position where the fibula becomes part of the bearing surface of the sole of the normal foot.

At present the boy has a very useful leg, the tarsal joints have taken on sufficient increased mobility to counterbalance the loss of the normal ankle joint, and we all hope the fibula with its extra burden may prove equal to the task imposed upon it until growth has been completed.

If from the time of the operation until full maturity, the normal tibia increases from 7 to 10 cm., it can readily be imagined what a deformity the absence of the lower epiphyseal line would result in if the statement made by Doctor Cushing, that it contributes one-fourth of the growth, is true. In this case the shortening would already be between 8 and 9 mm., certainly sufficient to cause considerable deformity even with prompt regeneration of the tibia, which is shown by the radiographs taken soon after the operation and on March 30, 1909, the former by Doctor Haiselden, the latter by Doctor Max Reichmann, to both of whom the writer is much indebted for their courtesy.

From a rather complete review of the literature by Doctor Carl H. Von Klein,[1] to whom the writer is also much indebted, it seems fair to class this as a unique case, and the experience of the patient and writer has been most satisfactory, and it is believed that deformity of a crippling nature incident upon the increase in height, will be entirely obviated.

December 12, 1905: The measurement from the lower edge of the right patella to the tip of the external malleolus was 32 cm., whereas the corresponding measurement of the left leg was 30 cm.

On February 11, 1910, the corresponding measurements were 37 and 35 cm.

MISTAKES IN DIAGNOSIS RELATING TO THE URINARY TRACT IN FEMALES[2]

By J. CLARENCE WEBSTER, M. D., Chicago, Illinois

WHILE it is true that great progress has been made during the last fifteen years in the exact determination of diseased conditions of the urinary tract in the female, it is quite certain that in ordinary practice mistakes in diagnosis are of the commonest occurrence.

Cystitis, a localized inflammation of the bladder, is usually regarded as a disease which is easily diagnosed, its cardinal clinical features being frequency of urination, pain in the bladder, and the presence of pus in the urine. Among practicing physicians the diagnosis is very generally based on the existence of one or all of these features apart from accurate physical diagnosis, and herein is the cause of many errors.

I have recently had under my care a patient complaining of frequent and occasional painful micturition, the urine containing abundant pus. Her physician had irrigated the bladder every two or three days with a mild antiseptic solution, and had administered urotropin by the mouth. He reported that the bladder was tender when felt through the vagina. As the patient had previously been infected with gonorrhœa by her husband, the physician had believed that there was a late Neisserian infection of the bladder.

I made a cystoscopic examination of the bladder and found a normal mucosa. The right ureteral orifice was elevated and surrounded by a dull gray gelatinous looking

[1] Annals of Surgery.

[2] Read before the Chicago Gynecological Society, January, 1910. See discussion, p. 435.

area, a quarter of an inch in diameter. On vaginal examination only the right half of the base of the bladder was tender, due to the thickening of the ureter. Examination of the right lumbar region revealed an enlarged kidney, and the urine was found to contain tubercle bacilli. In this case all symptoms were related to the bladder, and the mistake in diagnosis led to serious delay in dealing with the renal tuberculosis.

In other renal conditions, e. g., calculus, new growth, non-tuberculous pyelitis, hydronephrosis, a similar error in diagnosis may occur because attention is concentrated on the bladder.

I have known a woman to be treated for cystitis on account of painful micturition when the real cause was early locomotor ataxia. A similar mistake has been made in the advanced stage of this disease, when beside the pain, frequency of micturition was present. Fortunately, however, tabes is rare in women and such a mistake can but rarely occur.

In general diseased states, e. g., gout and rheumatism, bladder distress and frequency or urination, due to irritating conditions of the urine, may wrongly be attributed to the presence of cystitis.

Not infrequently, neurotic women are treated for disease of the bladder when there is absolutely nothing wrong in this viscus. I remember a case which was treated for inflammation for a considerable period without effect. She visited various European health resorts but was not cured. On her return to England from the last one visited she was considerably shaken in a railway collision and never afterwards did she complain of her bladder trouble. Another patient, belonging to the idle rich class, having consulted various physicians, finally found one who told her that she had cystitis. She found great relief after vaginal examination was made and when the bladder was irrigated by the physician. When he insisted that the treatment be carried out by a nurse her troubles returned. This patient was later cured by hypnotic suggestion.

Frequently, cystitis may be diagnosed when only minor affections of the urethra exist, e. g., urethritis, fissure, caruncle, inflammation of Skene's tubules. The latter condition is very easily overlooked, and may be a cause of distress for a long period. The condition of the urine may even be misleading. Thus, pus may be found, which may come from a uterine, vaginal, vulvar, or urethral discharge. Urine highly charged with phosphates, urates, or in a state of decomposition may be considered as purulent. Smegma bacilli may be mistaken for tubercle bacilli.

When there is a proteus infection of the bladder, the pus cells may be changed into a mucoid material and so overlooked.

Two interesting cases have recently come under my notice in which patients presenting the signs and symptoms of cystitis were treated for considerable periods with no benefit, because the real nature of the disease was overlooked.

In one of these, cystoscopic examination revealed a normal mucosa, but there was an opening in the bladder wall which communicated with an abscess cavity in the broad ligament. The latter had resulted from an infection following abortion. A cure was obtained by making a vesicovaginal fistula and enlarging the opening in the bladder-wall, drainage being kept up for about two months. The fistula was then closed.

In the other case, the patient had been treated for six months, the supposed cystitis following abdominal supravaginal hysterectomy. On making a cystoscopic examination an opening was found in the posterior wall of the bladder communicating with an abscess cavity in which a silk ligature was found encrusted with calcareous material. The latter was removed and the bladder was drained for several weeks by means of a vesicovaginal fistula which was afterwards closed, the patient recovering completely.

In each of these cases protracted ill health and distress resulted from failure to make an accurate diagnosis. This might have been avoided had cystoscopic examination been carried out early.

In various other pelvic affections in which bladder distress or frequency of urination is prominent, the actual diseased condition may be overlooked, e. g., uterine displacement, tumors, inflammatory swellings of the tubes and ovaries, adhesions, etc. I have seen several cases in which small fibroid tumors of the anterior wall of the uterus have caused dis-

tressing irritability of the bladder, leading to a diagnosis of cystitis.

Of great importance are the cases in which there is actual cystitis associated with some other condition which is of far greater importance.

I have operated on three cases of early carcinoma of the bladder in which the disease was not recognized until I had made a cystoscopic examination. In each instance cystitis alone had been diagnosed.

Very often tuberculosis of the urinary tract is allowed to develop unrecognized because cystitis is the most evident disturbance.

I have recently had under my care two cases of Neisserian infection treated for cystitis during many months, in which the cystoscope revealed extensive ulceration, which could be cured only be the establishment of a vesico-vaginal fistula.

Ulceration of the bladder may also easily be overlooked, especially when there is only a small amount of pus in the urine. Last year I saw a case of this kind which had been examined by several physicians, whose verdict was that the patient had a bladder neurosis.

Vesical carcinoma may sometimes cause symptoms relating to the region of the rectum, thereby leading to a mistake in diagnosis. I know of one instance in which the coccyx was removed because of pain felt in it.

In various affections of the kidney and ureter errors in diagnosis are frequently made. Inflammation of the lower portion of the ureter is frequently overlooked.

Indeed, there is widespread ignorance of the anatomic relations of this structure, very few being aware that when the lower end is thickened and tender it may easily be palpated through the vagina and rectum. When the affection occurs on the right side it is often diagnosed as appendicitis or as inflammation of tube or ovary. Removal of the appendix has been frequently carried out as a result of this error.

In one month I saw in consultation four cases of pregnant women in which operation for appendicitis had been recommended, when only right-sided pyeloureteritis existed. In each of these cases vaginal examination revealed a tender right ureter.

The condition of moderate right-sided hydronephrosis, is a common cause of trouble in women, and, as Kelly has so emphatically pointed out, it is very widely overlooked. As it is usually associated with abnormal mobility in the kidney, the troubles produced by it are very often referred to the gall-bladder, stomach, appendix, or other structures.

Movable kidney is so frequently found without disturbance of health, that there is a tendency on the part of many physicians to disregard its importance to a very great extent. Yet clinical evidence abundantly shows that it may produce a variety of symptoms and signs which are very apt to be related to other organs.

Some of these only need be mentioned. Attacks of pain in the right upper quadrant of the abdomen, accompanied by nausea and vomiting, may be attributed to disease of the bile tract. When jaundice is produced, as is sometimes the case, the mistake is all the more easily made.

When the attacks of pain are referred to the region of the appendix, disease in the latter structure is easily suspected, and many operations for appendicitis have undoubtedly been carried out in such cases. Not at all infrequent are the cases in which the symptoms are those of gastric disease, leading to incorrect diagnosis and ineffective treatment.

On the other hand the cases are numerous in which various conditions may be wrongly diagnosed as movable or enlarged kidney, because of evidence obtained entirely by manual examination. Some of these are tumors of mesentery or omentum, pedunculated growths of the uterus or adnexa, distended gall-bladder or tongue-like downward extensions of the right lobe of the liver.

PERIGASTRIC ADHESIONS SIMULATING PYLORIC STENOSIS IN INFANTS

By C. G. GRULEE, A. M., M. D., and J. E. KELLEY, M. D., Chicago, Illinois

THE subject of pyloric stenosis in infants has of late years been the source of so much discussion that any fact which will add to the eludication of any points in its etiology or that of allied conditions will be of some importance not only to the pediatrician but also to the surgeon under whose care such a large proportion of these cases finally come.

Mrs. O. C., aged 18 years, entered Provident Hospital July 8, 1909, on the service of Dr. H. M. Stowe. Her last menstrual period was August 28, 1908, and there was no history of any unusual disturbance of health during pregnancy. No other children, and no history of abortion or miscarriage.

On the 10th of July, at 2: 25 A. M., she gave birth to a boy after a perfectly normal labor. The puerperium was normal in every respect and she left the hospital on July 22d.

The baby, a male, weighing at birth seven pounds, four ounces, was apparently normal in every respect. The eyes were treated with a ten per cent argyrol solution and the cord dressed with gauze moistened in alcohol. Two meconium stools. Temperature 100.6° to 100.8° F. Baby very cross.

July 11. Child very fretful. Three meconium stools. Slight hæmorrhage from cord which was redressed. Temperature 99.2° F. to 103° F.

July 12. Weight, six pounds, eight ounces. Child no longer fretful. Three small green stools. Temperature 103° to 104.2° F.

July 13.[1] Child had a restless night, did not cry, but did not sleep. Three large and four small liquid green stools, two containing mucus and one curds. Given barley water, three ounces, every four hours, since weighing the baby before and after nursing at breast showed no gain. Temperature 100.8° to 104.8° F. Sponging for temperature. Given sweet spirits of niter, three minims every three hours. Colonic flushing of normal salt solution. Had to be coaxed to take bottle.

July 14. One small green stool voluntarily and four with flushings. Temperature as high as 104° F., but responds readily to sponging, dropping to as low as 99° F. Weight, five pounds, fourteen ounces. No nourishment from breast. General treatment continued. Colonic flushing given with acetozone 1-6000 instead of normal salt solution.

July 15. Temperature rose to 104.6° F., but, as previously, responded readily to sponging. One cyanotic attack which did not immediately follow sponging. Weight, five pounds, eight ounces. Very little urine. Results of flushing same as on previous days. At 8 P. M. on this day the child vomited for the first time. General treatment the same.

July 16. Temperature dropped to normal and then as low as 96.2° F. During this day the child had repeated cyanotic attacks but did not vomit any more. Weight, five pounds, six ounces. Six very small green slimy stools. Previous to this for a few days the icterus neonatorum had been quite marked, but now began to fade. Flushings discontinued. Spts. nitrosi ætheris, m. iii every four hours. Brandy in water every four hours. Feeding by gavage.

July 17. Temperature ranged from 97.8° to 98.6° F. Baby seems better. Only one cyanotic attack. Three small green stools. One attack of contraction of muscles of hands and arms with twitchings about nose, eyes, and mouth. Weight five pounds, six ounces. Fed by gavage. Nitrosi ætheris discontinued. Brandy continued.

July 18. Temperature ranged from 97.4° to 99.4° F. One very small green stool. Fed by gavage. After 8 A. M. feeding vomited one ounce. After 12 noon feeding vomited a large amount. Retained 4 P. M. feeding, some of 8 o'clock feeding and most of the midnight feeding. Brandy continued.

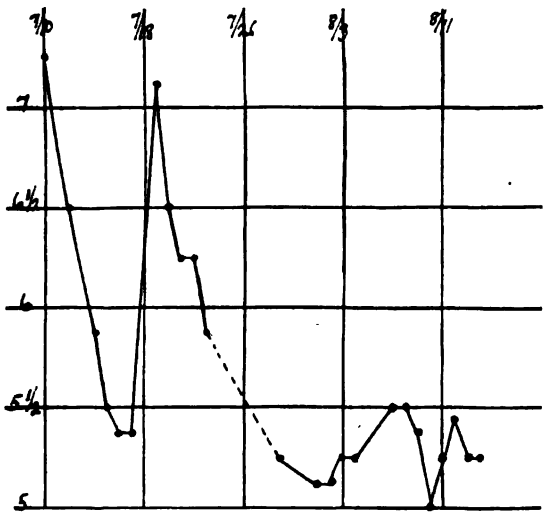
July 19. Temperature 97.8° to 98.6° F. Two small soft brown stools. Urination very small. Weight, seven pounds, two ounces. Severe cyanotic attack early in morning. Vomited all of 4 A. M. feeding as it did the other feedings during the day. Fed by gavage. Put to breast at 4 and 8 P. M. before being fed. Brandy discontinued.

July 20. Temperature 98.4° to 99° F. One small brown stool and one large brown salve-like stool. Weight, six pounds, eight ounces. Retained only one feeding. Still fed by gavage. Does not take breast well and gets nothing from it. Shows ulcers on each side at junction of hard and soft palate (Bednar's aphthæ) and also one in middle of the soft palate (probably a decubitus from passage of the stomach tube). Began to take nourishment from spoon.

July 21. Temperature 99.2° to 105.8° F. Weight, six pounds, four ounces. Four yellow or greenish yellow stools. Vomited feedings. Sponged for temperature, two colonic flushings of normal salt solution. Calomel, grs. 1-10 for four doses. Put to breast every four hours, but seemed to get nothing.

July 22. Temperature 97.4° to 103° F., but in general about normal. One large greenish yellow salve-like stool. Weight, six pounds, eight ounces. Continuous saline enema. Brandy in water every four hours. Rather extensive macular eruption on chest

[1] For feeding, see chart, p. 404.



Weight curve of Baby O'C.

and limbs which strongly resembled a scarlatinal rash but which had entirely disappeared in twenty-four hours. Blood, R. B. C., 7,800,000; W. B. C., 20,000.

July 23. Temperature 100.8° to 101.8° F. Weight, five pounds, fourteen ounces. Two small dark stools. Vomiting all of feeding although it was only barley water. Brandy discontinued.

July 24. Temperature 97.8° to 101° F. On examination of the stomach there were found to be distinct peristaltic waves passing towards the pylorus and forming a sort of pouch in the pyloric region, then relaxing when the peristaltic action was apparently at its height; at times the baby would gag as if nauseated but it never vomited. The peristaltic action of the colon was plainly to be seen and seemed to be directly influenced by that of the stomach but unfortunately the direction of the peristalsis in the colon was not noted. No tumor was palpable in the pyloric region.

The diagnosis of pyloric obstruction was made and immediate operation advised. The father refused to hear to this and removed the child from the hospital.

On the fifth day of life it was discovered that the cord was slightly infected. A probe could not be introduced into the umbilical vessels and in its course and appearance the infection was apparently a slight one.

The vomitus consisted usually of the milk ingested. As a rule this was brought up unchanged but sometimes there was some coagulation. However, at times, and especially as the vomiting became more severe, the presence of bile was not infrequent.

On July 25th, the day following its removal from the hospital, the father evidently became alarmed at the child's condition, since the child was returned to the hospital and consent for the operation was given.

July 25. When the child returned to the hospital the temperature was 103.8° F. That night it vomited even the water given it, but had one soft brown bowel movement. A continuous normal salt enema was given.

July 26. The temperature which at 4 A. M. was 98.6° F. had risen by noon to 105.6° F. Vomiting continued and vomitus was bile stained. Two stools, one large, soft and brown and one liquid and dark green. The peristaltic action of the stomach could be seen as above described. Normal salt enema continued. Colonic flushing given to reduce temperature, which fell under this treatment from 105.6° to 103° F. Strychnine sulph., grs. 1-1000 given once hypodermically. Infant was taken to the operating room at 10 P. M.

Operation. Report of Dr. Kelley. The abdomen was prepared for operation in the usual manner. Ether was used as an anæsthetic and administered by the drop method. When the cavity was exposed it was seen at once that there existed a condition of general and diffuse inflammation of the entire serous coat of all the intestines. The latter were seen to be deeply injected and in spots covered with a sort of tenacious white exudate, probably lymph. The transverse colon appeared prominently in the upper half of the abdomen and was markedly distended, almost to the size of the duodenum in an adult. There was a moderate degree of ptosis of the colon. The pylorus was searched for in an attempt to bring it into the field for inspection. This was not accomplished, due to the presence of rather firm adhesions in that region.

Two or three lap sponges were brought into use and the entire right upper quadrant of the abdomen was walled off by holding the main body of the intestine away with retractors. Inspection of this field revealed the following conditions:

The pylorus, upper portion of the duodenum and the hepatic flexure of the colon were rather firmly bound together by a roughly defined mass of adhesions, the result being to draw the pylorus and colon downward, though not a great distance. There was no evidence of concentric stricture or other occlusion within the pylorus. By gentle manipulation all the adhesions were freed and the pylorus slipped back into position. Simultaneously the colon collapsed.

The omentum, which had been held to one side during the operation was placed in position and a portion of it tucked in between the colon and pylorus at the point where the adhesions had existed, in the hope of preventing their re-formation.

A small amount of serous fluid which had been observed between the coils of intestine at the time of first opening the abdomen, was gently sponged away. It was not deemed necessary to drain the cavity. The abdominal wound was closed with through and through sutures of silkworm gut and a dry gauze dressing applied, after a collodion dressing was placed over the umbilicus, which had been infected from birth.

After return from the operating room strych. sulph., grs. 1-1000 was given hypodermically and the continuous normal salt enema was again started.

July 27. Temperature dropped to normal and did not rise above 101° F. Two soft brown stools. Vomiting continued, contained no bile but only some mucus. At times vomitus was curdy. Retained food ad-

ministered at 11 P. M. Normal salt enema discontinued. Strych. sulph., grs. 1-1000 given hypodermically every four hours.

July 28. Temperature ranged from 100.2° to 101.4° F., during the day, but rose to 104.2° F. at midnight. Did not vomit after 2 A. M. on this day. Two soft brown stools. Child much brighter and had a good night.

July 29. Temperature was 98.4° F. at 4 A. M., rising to 104.8° F. at 8 P. M. and dropping to 97° F. at midnight. No vomiting. One normal stool. Ice bag applied to head at intervals during the day. Infant fretful at intervals.

July 30. Condition unchanged except that temperature is much lower, even becoming markedly subnormal (96.4° F.). No vomiting.

July 31. Temperature 96° to 101° F. Otherwise condition same. No vomiting.

August 1. Condition same. Temperature not above 100° F. No vomiting.

August 2. Condition same. Temperature rose once to 99.4° F. Otherwise normal.

August 3. Temperature rose to 101° F. once. Otherwise no change.

August 4. Temperature rose as high as 102° F. Stitches removed by Dr. Kelley. Wound clean. Vomited once immediately after 8 A. M. feeding.

August 5. Temperature normal. Vomited once.

August 6. Temperature rose once to 100.6°. No vomiting.

August 7. Temperature tends higher, 99.8° to 100.8° F. No vomiting. Colonic flushing.

August 8. Child very cross. Temperature higher, up to 102° F. No vomiting.

August 9. Temperature not above 102° F., but more continuously high. No vomiting.

August 10. Temperature about the same. Vomited two ounces of 8 A. M. feeding. Two soft green slimy stools.

August 11. Child distinctly worse. Temperature up to 103.8° F. Vomited about a half ounce of the 9 P. M. feeding. Had to be fed with spoon.

August 12. Temperature at 4 A. M. 104.6° F., dropped to 100.2° F. at 4 P. M. No vomiting. Two greenish slimy stools.

August 13. Temperature down to almost normal, but child's condition much worse. Six soft brown stools, no slime. Given barley water, three ounces, every four hours, but vomited everything, even water. Infant sank rapidly and died at 11:25 P. M.

On the 11th the following clinical note was made: Child seems much worse. Forehead and cheeks corrugated with deep wrinkles. Cheeks relax at times but forehead never. Fingers flexed over thumbs, cannot be fully extended, especially marked on left side. Legs flexed on thighs and muscles so spastic that the legs will not remain extended. Trousseaus' and Chvosteks' signs absent.

Probe introduced into umbilicus penetrates about one inch downward along abdominal wall. No pus, no drop of blood. The contraction of the muscles relaxed quite perceptibly 24 hours before death.

Unhappily no autopsy was allowed.

FEEDING CHART OF BABY O'C

	July 12	July 13	July 14	July 16	July 19	July 22	July 24	August 1	August 3	August 8	August 10	August 12
Milk.....oz.	...	6	...	3	3	...	...	2	2	3	3	...
Skim milk.....oz.	...	...	7	4	3	...	10	8	8	4	4½	...
Barley water.....oz.	15	...	...	...	...	15	...	...	10	8	8½	...
Milk sugar.....oz.	...	½	...	...	½	...	...	½	½	½	½	...
Malt extract.....oz.	...	...	...	...	...	...	...	...	...	...	½	...
Saccharin.....gr.	½	...	...	...	...	½	...	...	...	...	...	½
Water.....oz.	...	9	9	8	6½	...	...	...	...	...	...	15
Number of feedings..	5	5	5	5	5	5	10	10	10	5	5	5
Amount.....oz.	3	3	3	3	2½	3	1	1	2	3	3	3
Intervals.....hrs.	4	4	4	4	4	4	2	2	2	4	4	4
Caloric value.....	45	186	77	107	156	45	110	160	190	167	207	45

The first thing to be considered in this case is as to whether the gastric adhesions were the cause of the first attack of severe vomiting. This can certainly be answered in the affirmative, since no vomiting occurred subsequent to twenty-eight hours after the operation. The vomiting immediately after the operation may, we think, be justly ascribed to the effect of the anæsthetic. It is impossible to say whether the adhesions re-formed, causing the second attack of vomiting or not, but it is at least permissible to consider this as very probable. That the vomiting was part of a general affection of the gastrointestinal tract is scarcely possible since with one or two exceptions the stools continued normal throughout the course of the disease and the vomiting bore no relation whatever to the nature or number of the stools.

To what were these adhesions due? Only two possibilities are to be considered: a general peritonitis following the infection of the cord, or a fœtal peritonitis. The sign of acute inflammation of the peritoneum at the time of operation (sixteen days after birth) were slight, we are justified in concluding that this condition existed before birth, especially since first vomiting occurred on the fifth day of life, too early for any adhesions to form from a septic peritonitis.

We have been able to find two similar cases in the literature, those of Mya (1) and of Czerny (2) and Peiser(3). That reported by Peiser was evidently not of a severe type because the adhesions were not divided until the child was five months old, and it was still living when nearly two years old. Peiser regarded this case as one of fœtal peritonitis.

Mya's case was in a girl baby fifty-two days old, in a state of extreme atrophy. The dis-

tended abdomen showed sausage-shaped tumors, that of the stomach showing a peristalsis from left to right and that of the transverse colon from right to left. Vomiting and stubborn constipation. At autopsy the stomach was hour glass in shape caused by strong adhesive bands and was tightly adherent to the transverse colon. The other internal organs showed nothing of interest.

The temperature curve is such a peculiar one that it would seem to deserve special attention. Almost immediately after birth the temperature rose above normal and continued so until the fifth day. It may be noted that the vomiting started on this day. This may have been the so-called "starvation fever" of the new-born which Czerny and Keller (4) believe to be due to an infection of the gastrointestinal tract. They also believe the umbilical infections in the new-born are secondary to an enteric infection, all of which would very readily explain the course of this fever for the first few days. It is to be noted that the baby took nourishment fairly well at least twenty-four hours before the temperature dropped, and that feeding by gavage was not resorted to until twenty-four hours after. The second rise in temperature followed an interval of five days in which the temperature was normal. This second rise of temperature was almost as marked as the first and was concomitant with severe vomiting. After the operation, the temperature remained high for five days, never, however, becoming completely normal. The whole picture resembles that of septicemia and although the cord symptoms were slight still it is hardly possible to regard this regularly remittent type of fever as a part of the clinical picture of the gastric adhesions. The cyanotic attacks may probably be explained as a symptom of the septicemia.

The weight curve is a peculiar one and the writers are absolutely at a loss to account for the wide variation in the first few days.

We have then, referable to the gastric adhesions, vomiting beginning on the fifth day of life, at first slight but gradually becoming very severe and occurring no matter what the food ingested might be. The vomiting occurred usually immediately after eating, but was sometimes delayed as long as a half hour. This vomiting was almost immediately relieved by division of the adhesions. The vomitus at first consisted of unchanged milk, or at times curdled, but later it was bile stained, a condition very infrequently encountered in true pyloric stenosis in the infant (5). The peristaltic waves differed in no way from those of pyloric stenosis, but the involvement of the colon in this action was so suggestive that Dr. Kelley suspected adhesions to be present.

As to what bearing this case may have on the question of pyloric obstruction in infants (6) the nature of which disease is so much discussed at present it would be hard to say. This much at least may be concluded — that increased peristalsis may be primarily due to obstruction at the pyloric orifice and that the removal of this obstruction may result in the disappearance of these peristaltic waves.

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ACUTE DIFFUSE SUPPURATIVE PERITONITIS FROM A RUPTURED PUS TUBE[1]

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PERHAPS to many gynecologists, who for a considerable number of years have been assisting to definitely decide upon the proper treatment of suppurative infections of the uterine appendages in women, the title of this contribution may recall memories. But the condition of a patient who, from a ruptured pyosalpinx, has a general suppurative peritonitis rapidly becoming fatal, is one that does occasionally occur and its gravity demands rare surgical judgment and skill. It is quite probable that when the purulent contents of a Fallopian tube have become sterile, rupture of that structure with escape of its contents into the peritoneal cavity may occur with little or no harm to the individual of which it is a part. Not uncommonly are the fimbriated ends of such tubes fround permeable and without macroscopical appearances of inflammation in their vicinity, though pus may be coaxed or kneaded from the lumen of them. Again, localized peritonitis about suppurating tubes is quite the usual condition noticed. It is to another and very different condition I would invite attention, which is, Fallopian tubes distended to a considerable degree by infected fluids to which is added the phenomena of sudden and notable rupture of the tube with escape of the contents into the general peritoneal cavity.

An experience of this character has been mine and I will detail it as follows:

During the early morning of May 7, 1909, I saw, in consultation with Dr. Ramsburg, a woman 38 years of age who apparently weighed about two hundred and thirty pounds. Dr. Ramsburg stated he had attended the patient professionally for a few years and had delivered her of her third baby in January, 1909. During coitus early in the morning of May 4th, she had experienced very severe pain in the right iliac region. He saw her promptly and at 6:45 A. M. found her in some pain, but a pulse rate of 76 and temperature of 98.4° he noted in his minutes. By enemata her bowels were freely moved and at 11:30 A. M. the temperature was 103.6° and the pulse rate 120. The following morning (9:30 A. M.) the temperature was 100.6° and the pulse 84. During the night the bowels had moved six times. About 4 P. M. temperature was 101.2° and pulse 106. The following day the temperature ranged from 101.6° in the morning to 103.2° at 8 P. M. Her condition was little changed. The pulse reached 120 that evening. At my first visit we found her temperature was 101.6° and the pulse 100. She was complaining of having a severe pain in the right inguinal region. A quite careful examination failed to find an unusual mass at any place and on bimanual examination I could find no evidence of a pathologic appendage. To place her in a hospital for careful observation, and possibly operation, seemed advisable and she was at 10:30 A. M. admitted to Columbia Hospital for Women. At 4 P. M. her temperature was elevated to 102.4° while the pulse remained at 88. A leucocyte count was made and a report of 23,100 returned. She seemed brighter and operation was deferred, yet considerable gaseous distension of the intestine was troubling her. On the 8th she was progressing toward recovery, apparently, when late in the afternoon, after freedom from pain since morning, the temperature at noon being 101° and the pulse 84 to 90, she was again attacked by pain, now very violent, in the right inguinal region with a chill followed promptly by collapse. The abdomen rapidly increased in tension and in the evening an operation was done. An incision was made a little to the right of the right linea semilunaris, its upper end being opposite the umbilicus. When the peritoneum was incised a considerable quantity of thin seropurulent material poured out through the opening. The cæcum and vermiform appendix were found much nearer the diaphragm than they are usually placed and macroscopically normal. The right Fallopian tube was from one to one and a half inches in diameter and ruptured. It was exceedingly friable and removed in pieces, the stump being whipped over by catgut. Several intestinal loops were adherent to this tube but easily separated. The pelvis was lightly packed with gauze, one end of which was carried through vagina and vulva. At the end of the operation her temperature was 99.2° and pulse 120. At noon the day after operation the temperature, rising gradually, had reached 103.4°, but twelve hours later had dropped to 101.8°, and the pulse to 100. The drop method of instilling salt solution into the rectum had been employed faithfully since her admission to the hospital. The bowels were at noon moved well with a purgative enema. On the 10th the condition

[1] Read at the Twenty-second Annual Meeting of The Southern Surgical and Gynecological Association at Hot Springs, Virginia, December 14, 15, and 16, 1909.

was worse; vomiting was an additional symptom and the end seemed near. It came at 3 A. M., the 11th, nearly seven days after the first severe pain and about 54 hours after the operation.

That the condition is a rare one is suggested by the small number of cases reported, that the largest number reported from the experience of one man is six (Boldt) and that several have reported one or two. Bonney states he wrote fifty surgeons asking for reports of their experience with such cases. Of the forty who replied but fourteen had seen the condition. He received in this way notes on fourteen cases. In a moderately careful review of medical literature I have found fifty-five cases, which added to the one I herein report makes a total of fifty-six cases. It is quite probable a careful perusal of all reports and tables of series of surgical treatment of pyosalpinx and of acute peritonitis would disclose a few more. But I think the infrequency of the condition must be apparent. The gravity of such a calamity is shown in the high mortality attending it, thirty-two (58 per cent) having died, either with or without operation. In one (Anderson's) the result was not given and the case was reported the day of the operation.

Etiology. An inquiry into the causes of pyosalpinx rupture into the peritoneal cavity with resulting acute peritonitis carries with it the presumption that the infecting organism in the tube was permitted to pass through the rupture in sufficient strength to immediately involve the whole peritoneal surfaces in the same process as existed in the tube. The larger part of tubal infections producing suppuration is caused by the gonococcus. Yet in no instance in this series of cases was that organism found in the abdominal contents. In but a few were bacteriological reports made. Frank found the staphylococcus pyogenes aureus, and the colon bacillus was recognized by another. I will not here enter into a discussion of the various pathogenic organisms that produce suppuration of the Fallopian tube. We are informed by some careful observers that the gonococcus is not capable of extensively injuring the peritoneum and, *per contra*, others insist peritonitis of a fatal character may be produced by this organism unassisted. But those of us accustomed to treat extensively tubal infections and to await an innocuous state of the pus before operation are impressed by the very large proportion in which but a few days or weeks are required for that state to be reached. In these the gonococcus is probably acting alone. But can all these temporarily quiescent cases be thus produced? If so can the gonorrhœal tube contents be suddenly aroused to fury when allowed in liberal quantities to reach the peritoneum, or is the infection of the tube of a mixed character, all the varieties remaining quiescent until rupture occurs, a period of months in some of the cases reported? In most cases violence of some sort was reported. Perhaps it was not more than transportation to a hospital for treatment for pelvic inflammation (Ingalls, Vance, Mann) and during the following day or two acute and striking symptoms would ensue, ofttimes, the patient had not been out of bed for several days just preceding the rupture. In several instances the traumatic element was childbirth. In this respect, the experience of Oleson, of the Cook County Hospital, Chicago, was unique. He had at one time two cases in which this accident caused death in the puerperium. In one the labor at eight months was rapid and death occurred five days later. In the other the labor was of so short duration that he had not time to get into the ward before the birth and she also died in five days (see table). A few quickly followed currettage and Legueu reports two that were noticed as soon as the accident occurred, which was during a bimanual examination of the pelvic contents. Two occurred during coitus and another was probably a direct result of the woman lifting a heavy child.

Symptomatology. In the cases that ruptured during labor the symptoms of this grave accident were clouded by those of labor, and in them usually an autopsy revealed the first knowledge of the real pathology. Fabricius' case is a bold exception and the only one that recovered. In the others, the symptoms are quite like those of ruptured tubal pregnancy or tubal abortion. Usually, however, the patient is ill with pelvic inflammation but perhaps does not remain in bed. While at her duties, after recovery from an attack of infection of the uterine appendages, or resting

TABLE OF CASES OF ACUTE GENERAL PERITONITIS FROM RUPTURE OF PYOSALPINX

Reported by	Duration or stage of peritonitis.	Notes.	Result.
1. Chipault, Bull. Soc. Anat. de Par., 1861, xxxvi, 149.	Acute, general	No operation. Autopsy findings: Right tube distended with pus, left tube contained some pus and had a small rupture; cancer of uterine cervix was advanced	Death.
2. MacLaren (see Bonney)	Acute, general	Second day of attack, incision, with flushing and drainage. Autopsy findings: A ruptured, distended pus tube and general peritonitis	Death 2 days after operation.
3. Almagro, Bull. Soc. Anat. de Par., 1862, xxxvii, 171	Acute, general	No operation. Autopsy findings: Pus in abdominal cavity, right tube enormously distended by pus and has a rupture 4 cm. long; left tube also distended but not ruptured	Death 2d day in hospital.
4. Rochet, J. d'accouch., 1892. xiii, 195	Acute and general	Five days after admission to hospital abdominal and vaginal sections were made, drainage employed. Autopsy findings: General purulent peritonitis, with tubes enlarged and the right ruptured and containing pus	Death promptly followed.
5 C. S. Wood, Tr. N. Y. Med. Assoc., 1890, vi, 49	Acute, general	Operation during the first 24 hours by W. Gill Wylie, during collapse, abdominal section, right pyosalpinx had ruptured	Recovery.
6. E. G. Janeway, N. Y. Med. J., 1880, xxxii, 522	Admission on 14th day of attack	No operation. Autopsy findings: General peritonitis, patches of fibrinous lymph on liver, intestine, and uterus, 12 ounces of pus in pelvis, right pus tube ruptured, left pyosalpinx unruptured	Death 4 days after admission
7. Spehl (reported by Wicot) Clinique, Brux., 1893, vii, 529	Ill with the attack of pelvic peritonitis 14 days before admission	No operation. Autopsy findings: Pus pocket in inferior right lobe of lung, pus very abundant in peritoneal cavity; intestinal loops covered by fibrinous, thick, and very adherent exudate, circular rupture in left tube 2 cm. in diameter	Died 12 days after admission to hospital.
8 and 9. Legueu, compt-rend, Soc.d'obst.,de gynec. et de paed-de Par., 1903, v, 83	Both acute	Operation was done at once. Both were ruptured by examination and abdominal section 1½ hours later in one, and 1 hour in the other, ruptured tube found in each	Both recovered.
10. Peuch, compt-rend, Soc. de biol., Paris, 1860, 3d s., i, 27	Subacute	No operation. Autopsy findings: Cystic left ovary; inflammation and abscess of both tubes, one ruptured and abdominal cavity deluged	Died 3½ months after admission to hospital.
11. Cerné, Bull. Soc. Anat. de Par., 1880, xiii, 37	Seized 3 days before admission	Autopsy findings: Ruptured left tube and general acute peritonitis, intestinal coils adherent	Died 3 days after admission.
12. Proust and Mascarenhas, Bull. et mem. Soc. Anat. de Par., 1909, lxxxiv, 294	Admitted on 6th day of attack	Operated upon at once upon admission. Large quantity of fetid, purulent fluid escaped from the abdominal incision, rupture found in lower posterior surface of the right pus tube, the latter removed, left tube normal, drainage	Recovery.
13. Fabricius, Wien. Klin. Woch., 1897, x, 1056	Acute, ruptured during labor	Prompt operation with removal of the ruptured tube	Recovery.
14. Boldt, Am. J. Obst., 1889, xxii, 262	Acute, general	Operation done on the 6th day, pus found in peritoneal cavity' intestines matted together; both tubes ruptured	Death in 60 hours.
15. Boldt, ibid.	Acute, general	On second day abdomen was opened and right tube found ruptured	Died.
16. Boldt, ibid.	Acute	Operation a few hours after rupture of right tube, perforation 2 cm. in diameter, free fluid in peritoneal cavity and the peritoneum considerably congested	Recovery.
17. Boldt, ibid.	Three days' duration	Operation refused. Autopsy findings: Peritoneal cavity full of pus, intestines matted, double pyosalpinx, the right ruptured	Died.
18. Boldt, ibid.	Acute	Operated upon 3 hours after onset and in collapse, free fluid in the peritoneal cavity and the left pus tube ruptured	Recovery.
19. Boldt, ibid.	Acute	Operation deferred too long because of apparent improvement, operation was not done at all. No autopsy	Death in 36 hours.
20 and 21. H. Brin, Arch. méd. d'Angers, 1900, iv, 556	Both acute	Autopsies disclosed ruptured pus tubes and acute, general peritonitis	Both died.
22. Cotte and Chalier, Rev. de gyn. et de chir. abd., 1907, xi, 579	Admitted 2 days after beginning of attack of acute perforative peritonitis	Operation a few hours after admission. Peritoneal cavity found full of sero-purulent fluid, intestines not adherent. Nothing but insertion of drainage tube into pelvis was done. Autopsy, perforation in a right pyosalpinx large enough to admit little finger	Died 40 hours after operation.
23. Cotte and Chalier, ibid.	Acute, general, of two days' duration	Operation day of admission, free fluid in peritoneal cavity and pus in pelvis. Left pyosalpinx found ruptured, collapsed and nearly empty, perforation in middle of a gangrenous area near ampulla, appendage removed and drainage through abdomen and vagina	Death 3 days after operation.
24. Cotte and Chalier, ibid.	Advanced, general	No history obtainable, condition very grave, precluding operation. Autopsy showed rupture of right pyosalpinx	Death a few hours after admission.

TABLE OF CASES OF ACUTE GENERAL PERITONITIS FROM RUPTURE OF PYOSALPINX—Continued

Reported by	Duration or stage of peritonitis.	Notes.	Result.
25. Cotte and Chalier, ibid.	Admitted 6th day of attack of general peritonitis	Operation a few hours after admission, free fluid in peritoneal cavity and pus in pelvis; perforation ½ cm. long found in anterior surface of a right pyosalpinx, tube not removed, abdominal and vaginal drainage, condition precarious, repeated operations during the following three months ended the condition	Recovery.
26. Cotte and Chalier, ibid.	Admitted 3d day of attack of general peritonitis	Operation one hour after admission; large quantity purulent fluid in peritoneal cavity. Two perforations found in large right tubo-ovarian abscess, one as large as a franc piece	Died 24 hours after operation.
27. Bullitt, Louisville J. of Med. and Surg., 1900-1, vii, 471	Acute, general	Admitted for operation for chronic salpingitis and pelvic peritonitis — no urgent symptoms though abdomen distended and painful — operation deferred, suddenly became worse; died 48 hours after admission. Autopsy revealed general peritonitis and a large perforation in a left pyosalpinx	Death.
28. Cartledge, Louisville J. of M. and S., 1900-1, vii, 472	Acute, general	Moribund when first seen, perforation of left tubo found as cause of peritonitis at operation	Death.
29. Vance, Louisville J. of M. and S., ibid.	Acute	Admitted to hospital for minor gynecological treatment, next day suddenly became shocked and abdomen opened in three hours. A ruptured pus tube was found	Recovery.
30. Abell, ibid., 1906-7, xiii, 403	Acute	Operation third day of illness, a ruptured right pyosalpinx found	Recovery.
31. Anderson, ibid., 153	Acute	Operation and both tubes contained pus and ruptured and general peritonitis, patient was living at time of report which was made on day of operation	Not known.
32. Leith, African Med. Rec., Cape Town, 1907, v, 230	Acute, general	Operation first day of attack, parietal peritoneum, thickened and congested and lymph on intestines, left pyosalpinx ruptured	Recovery.
33. Young, Boston M. and S. J., 1905, cli, 551	Acute, general	Admitted 3d day of attack of pelvic suppurativei nflammation. The following day had excruciating abdominal pain, vomiting, collapse, and rapidly developing peritonitis. Operation without delay, pus found in all parts of peritoneal cavity, a ruptured pyosalpinx was found and exsected	Recovery.
34. Fenwick, Lancet, Lond., 1897, ii, 1385	General, suppurative	Died two days after admission and without operation. Autopsy showed general suppurative peritonitis, evidence of old pelvic inflammation, and a ruptured pus tube discovered	Death.
35. Oleson, Chicago Med. Rec., 1894, vi, 324	Acute, general, suppurative	Died 5 days after labor at which pus tube probably ruptured. Autopsy showed a pus tube ruptured near fimbriated end and general acute suppurative peritonitis, rapid labor at eight months	Death.
36. Oleson, ibid.	Same as in 35	Rapid and sudden delivery before arrival of obstetrician in ward; 2 days later chill and T. 103.2°; died 5 days after labor. Autopsy findings the same as in case 35	Death.
37. M. Price, Am. J. Obst., 1889, xxii, 925	Acute, suppurative and general	Operation 15 days after apparent rupture of a pyosalpinx in a case of incomplete abortion; both tubes had ruptured	Death.
38. Louis Frank, Med. News, Phila., 1895, lxvi, 609	General, acute, suppurative peritonitis	Admitted to hospital in midst of an attack and next morning was in collapse, laparatomy a few hours later, the patient died in 9 hours. Autopsy revealed rupture of a right tubo-ovarian abscess	Death.
39. Mann, Am. J. Obst., 1907, lvi, 461	Acute, general	Patient in hospital for pelvic suppuration. Sudden onset of alarming symptoms on 2d evening after; next morning operation showed right pus tube ruptured an inch from fimbriæ and general peritonitis.	Recovery.
40. Mann, ibid.	Acute, suppurative, general	Two days after an examination by a physician, who diagnosed tubo-ovarian abscess, was suddenly attacked by illness and collapse promptly ensued. Operation done at once, a large tubo-ovarian abscess, ruptured, was found, the opening being the size of a ten cent piece	Recovery.
41. Cushing (see Bonney) Surg., Gyn. and Obst., 1909, ix, 542	Acute, suppurative	Operation day of rupture of a tubo-ovarian abscess into peritoneal cavity	Death.
42. Dudley (see Bonney)	Acute, suppurative	Operation a few hours after rupture of a pyosalpinx into the peritoneal cavity, complicated by rupture of vermiform appendix	Recovery.
43. Findley (see Bonney)	Acute, general, suppurative	Induced criminal abortion followed in three weeks by curettage for infection of uterus and appendages; 3 days later evidence of general peritonitis; operation refused and death 4 days later. Autopsy, double pus tubes; the left contained a large perforation causing diffuse suppurative peritonitis	Death.
44 and 45. Gardner (see Bonney)	Acute, general, suppurative	Two cases practically alike. Both admitted during attack. Operation both tubes found to be enormously distended with pus and one had ruptured contents free in peritoneal cavity. Neither had acute fulminating peritonitis	Recovery in both cases.

TABLE OF CASES OF ACUTE GENERAL PERITONITIS FROM RUPTURE OF PYOSALPINX—Continued

Reported by	Duration or stage of peritonitis.	Notes.	Result.
46. Ingalls (see Bonney)	Acute, suppurative	Patient in hospital and treated for acute salpingitis. Late one afternoon found in collapse; abdominal distension rapidly followed. Operation in a few hours. A ruptured pyosalpinx removed, abdominal drainage	Recovery.
47. Ingalls (see Bonney)	Acute, suppurative	Admitted to hospital 6 hours after rupture and 3 hours later operation. General peritonitis and a ruptured pyosalpinx removed. Vaginal and abdominal drainage, fever continued	Death in 3 months.
48. MacMonagle (see Bonney)	Acute, septic	Patient apparently ruptured pus tube in labor and had acute septic peritonitis, dying on the 4th day. Autopsy, left tube had ruptured and discharged pus into peritoneal cavity	Death.
49. MacMonagle (see Bonney)	Acute, general, suppurative	Young woman on whom an abortion had been attempted. acute peritonitis followed. Operation immediate, when first seen and right tube found ruptured	Recovery.
50. Smith (see Bonney)	Acute, suppurative	Patient seen one hour after rupture, operated on at once, pyosalpinx had ruptured in the middle and deluged peritoneal cavity	Recovery.
51 and 52. Webster (see Bonney)	Acute, fulminating	In both a pyosalpinx had ruptured into the general peritoneal cavity and gave rise to an acute fulminating peritonitis. Both made stormy recoveries. Operation done during first few hours	Both recovered.
53. C. W. Bonney, Surg., Gyn. and Obst., 1909, ix, 542	Acute	Suppurative inflammation of the appendages had probably existed 3 weeks before very alarming abdominal symptoms and apparent imminent death induced her removal to hospital at night and operation, 5 hours after first alarming symptoms an abundant outflow of sero-purulent fluid from abdomen, intestines injected and distended, a partly collapsed right, large pus tube was found perforated. Appendage removed, peritoneal cavity flushed out, abdominal drainage	Recovery.
54. A. Theilhaber, Muench. Med. Woch., 1905, lii, 69: 122		This author in an article of six pages on "The pathology and therapy of chronic salpingitis" merely mentions a case in which perforation was followed by an unsuccessful operation	Death.
55. A. Mary, Sur un cas de rupture de pyosalpinx pendant l'accouchement, Thèse de Par., 1908	Acute	A girl of 16 years, died six days after labor. Temperature was never normal afterwards. Two day post-partum curettage was done as the pulse was 125 and T. 102.4°. Autopsy revealed general peritonitis and a large right pyosalpinx rupture midway in the length of the tube	Death.
56. Author's	Acute, diffuse	Severe pain through iliac region during coitus, under observation by me from early in 4th day, symptoms of rupture on fifth day of illness, operation done a few hours later. Tube had ruptured and inundated the peritoneum with pus	Death 3d day after.

comfortably in bed, perhaps in a hospital preparatory to surgical operation, she suddenly experiences excruciating localized pain, perhaps a chill and collapse. Fever and high thready pulse promptly follows, if death does not soon supervene, and distension of the abdomen together with the general symptoms of diffuse peritonitis are not long delayed. Sometimes the surgeon being familiar with the pelvic contents before rupture has readily discovered after it that the tube was collapsed and flaccid instead of full and tense as before rupture.

Diagnosis. When rupture occurs during labor the accoucheur should discover a considerable softening in a mass existing at the side of the uterus before labor, and symptoms of peritonitis appear so promptly that they should be readily recognized. The cause of the peritonitis would then have to be learned by a process of exclusion and a knowledge of of the ante-partum symptoms and tubal conditions will markedly assist in reaching a correct diagnosis. In non-puerperal cases the previous history of pelvic infection accompanied by suppuration, the absence of evidence of pregnancy, especially tubal, together with the rapid appearance of the symptoms of diffuse peritonitis, should be sufficient for a diagnosis. When the right tube has thus ruptured it has been mistaken for fulminating appendicitis. The previous history will be an important element in making differentiation. In those cases in which the vermiform appendix is simultaneously markedly involved the differentiation or possibility of diagnosing both conditions is not always present.

Prognosis. What can be said of the pros-

pect of recovery? It requires no comment when the death rate in all cases is fifty-eight per cent and one hundred per cent without operation. Much depends upon whether a previous severe attack of pelvic infection has left the patient with little or much resistance; whether the total of virulence of the invading tubal contents be great or slight, the general condition of the patient independent of these features; and the form of treatment instituted. At the best these patients must be considered as in a critical condition, and whatever the plan of surgical treatment employed, it must be instituted with the least possible delay.

Treatment. All of the eighteen that were not operated upon died. The time they lived after rupture varied from a few hours to three and a half months. Two patients admitted to hospitals on the fourteenth day after rupture lived respectively four and twelve days. Of the 12 others that died without operation of which data is obtainable the average number of hours they lived was fifty-nine.

Thirty-eight were operated upon and fourteen of them died — a mortality rate of 37 per cent. One of this series (Ingalls) lingered along for three months in the hospital and yet her operation was but nine hours after rupture. But three of the post-operative fatalities were in patients operated on during the first twenty-four hours after rupture. The other deaths had preceded the operation by from two to fifteen days. One operation was done during the first few hours (Anderson) and reported the same day without the result being mentioned. Of the twenty-three in which successful operations were done, in twenty it was performed during the first twenty-four hours. Such expressions as "immediately," "at once," and "few hours" are used in the reports of them. The other three successful operations were done, one on the third and two on the sixth day. Twenty-five of the operations were done during the first twenty-four hours. In one of these no result was given. In the other twenty-four operations five were unsuccessful. One of the five deaths occurred in nine hours, one in fifty-four hours, and one in three months. The three patients operated on during the second day all died. Of three operated on the third day one recovered. Of the seven operated on more than three days after rupture had occurred four died. We find the mortality rate, then, for operations during the first day after rupture was (excluding Anderson's case) nearly 21 per cent; for those done during the second day, 100 per cent; for those done during the third day, 67 per cent, and for those done after the third day, 57 per cent. It would seem, then, that if possible all cases should be operated upon, since in all of the eighteen reported in which no operation was done death resulted. The comparatively small mortality rate of the first-day operations would seem to demonstrate the decided urgency of operating the first day and without delay. While but one of the six operations done on the second and third days was successful, three of the seven done at more remote periods were successful, and we should be encouraged to operate even if considerable time has elapsed since rupture, although moribund patients do not present a hopeful spectacle to the abdominal surgeon. The late lamented Cartledge states in the report of his fatal case of this kind that enthusiasm and ignorance of early experience led him to operate, but that greater experience and better judgment would form an opposite decision.

DEPARTMENT OF TECHNIQUE

CONCERNING SUPRAPUBIC PROSTATECTOMY[1]

By L. L. McARTHUR, M. D., Chicago, Illinois

I DESIRE to preface my communication with the statement that I am an advocate of both the suprapubic and the perineal routes; suiting the operation to the case in question.

Permit me after a personal experience covering a considerable period, but not a large series of cases, to invite your attention to a procedure when doing a suprapubic prostatectomy, worthy of our higher esteem and more frequent employment.

You will recall that the customary and recognized step after the fundus of the bladder has been opened is in one of various ways to perforate the bladder mucosa to one or both sides of the internal meatus, or behind the latter. Through these openings made at the discretion of the operator, either with the knife, scissors, or the finger, the lobes of the prostate are loosened and enucleated by a blunt dissection with the fingers. In this enucleation, I believe all of us are free to admit that a great portion of the prostatic mucosa is at the same time torn and removed. Since this is the case can we do anything to lessen the trauma attendant on the above procedure? It is in the belief that an affirmative answer to the above question is justified that I venture to recall to your attention what has failed of general adoption, though long known.

It is this: There is no need (nor excuse?) for the wounds made through the bladder wall to gain access to the prostatic lobes. Proof of this, if needed, could be found in the modern median perineal prostatectomy which makes just sufficient perineal wound to permit the index finger free access to the prostatic urethra. With the finger thus introduced into the urethra the lobes are more or less readily removed. If, from without, one can so readily remove the lobes by a lateral tear in the prostatic urethral mucosa one can by identically the same procedure remove them by the introduction of the finger into the prostatic urethra through the *internal* meatus. The difference being that the finger is directed toward the apex of the gland instead of toward its base.

The points I desire to emphasize then are:

1. It is quite unnecessary in most cases to make any wound in the bladder mucosa or wall in the neighborhood of the internal meatus.

2. When making the lateral tears in the prostatic urethral mucosa do so for both lobes before doing any enucleation, taking pains to make these tears in the long axis of the urethra and endeavoring on both sides to loosen their margins from the prostatic lobes, before any step whatever is made to loosening of prostatic lobes from their capsules.

3. In all those prostatic hypertrophies bulging into the bladder as an enlarged uterus does into the vagina, there is scarcely more than mucosa covering the prostatic tissue, hence after enucleation through the internal meatus, the internal sphincter, that whorl of vesical muscular fibres situated in the bladder substance itself, has not been disturbed, or at most distended, while perforation of the bladder wall near the meatus may easily injure the sphincter fibres or paralyze them. Moreover, when the prostatic bodies which constituted the projection into the bladder have been removed, the mucosa covering the same, lacking its former support, now drops into the internal meatus and covers part at least of the denuded prostatic urethra.

4. The bladder trigone being drained by an efficient syphon and having made no wounds within the bladder, urine has little opportunity to stagnate over denuded surfaces.

[1] Read before the Chicago Surgical Society, February, 1910. See discussion, p. 437.

RAFFIA RIBBONS AS DRAINAGE MATERIAL

By SAMUEL E. NEWMAN, M. D., St. Louis, Missouri

OUR knowledge of the mechanical and the physiological principles of drainage has increased. Wounds are closed which we formerly drained, and small well-placed drains have supplanted the less carefully applied large crude forms.

1. When a hollow viscus or a cavity is to be drained, frequently a hard or soft tube is employed; i. e., *tissue intubation*.

2. If our aim is to establish an outlet for wound secretion or the eventual accumulation of serum and pus, we select material to aid in the formation of a channel; i. e., *tissue canalization*. To this end a capillary or a non-capillary material may be chosen.

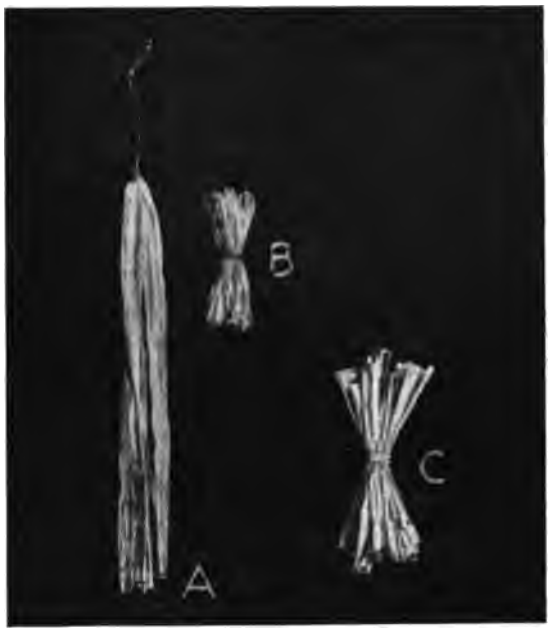
3. In *tissue walling* the main object is temporary protection for the structures and the formation of a defense barrier.

4. When hæmostasis of the tissues is the end in view, *tissue packing* is employed.

Under these captions we have four entirely distinct varieties of drainage, and it is to the subject of *tissue canalization* that I wish to add a material called *raffia*. *Raffia* is a vegetable fibre and is obtained from a variety of palm tree indigenous to Madagascar Island. To quote an article on the subject, "The under part of the green palm leaf is of a pale greenish color, and from that side the skin can be peeled off in the same manner as the skin on the inside of a pea-pod, except that it peels off straight to the tip without breaking. It is then of the palest green, and after being dried in the sun assumes a light straw color. This is the raffia of commerce." In our country this material is employed in basketry and florists use it as cordage. It is obtained in large twisted skeins, each skein containing a great many ribbons of from three to four foot lengths.

PROPERTIES OF RAFFIA

When dry it is a pliable cord easily split in a lengthwise direction, but possessed of unusual strength and does not break. When wet, raffia is as soft as wet paper and tends to spread out in ribbons of from one-half to one inch in width. It does not deteriorate at the temperature of boiling water, nor is it injuriously affected by watery or antiseptic solutions. Capillarity is one of its qualities and the strands rapidly absorb water. The capillarity of raffia is however not as marked as that of gauze, and where this feature is of importance, all things being equal, the gauze should take preference.



USING THE RAFFIA

The material may be boiled at the same time with the instruments, or it may be preserved ready for use, in an antiseptic solution. Drains which have not been used are not wasted and may be resterilized. Fig. B represents a folded bundle of raffia in convenient form, and Fig. A is the unfolded bundle of ribbons. Several fascicules may be placed in a wound and the individual bundles removed on different days, or when a single bundle is employed in a small wound, the individual ribbons may easily be withdrawn. In Fig. C a sheaf of ribbons for minor surgery is shown; one or more of the strands may be employed as a drain and the remainder is again replaced into the antiseptic solution.

As far as my observations can determine, raffia possesses no objectionable features. The ribbons are perfectly bland and remain in the tissues unaffected by secretions. There is no danger of a decubitus from contact and healthy granulations grow around and not into the fibre.

The inexpensiveness of this material is of practical importance.

REMOVAL OF TUMORS OF THE PITUITARY BODY

WITH A SUGGESTION AS TO A TWO-STEP ROUTE, AND A REPORT OF A CASE WITH A MALIGNANT TUMOR OPERATED UPON WITH PRIMARY RECOVERY

BY ALLEN B. KANAVEL, M. D.
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AND

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Professor of Nervous and Mental Diseases, Post-Graduate Medical School; Assistant Professor of Nervous and Mental Diseases, Northwestern University Medical School, Chicago, Illinois

SURGICAL DISCUSSION (Kanavel)

THE successful removal of tumors of the pituitary gland is still uncommon in spite of the attention the subject has received. In the Journal of the American Medical Association of November 20, 1909, I reported a proposed operation for the removal of these tumors. I had removed such a tumor a week previously from the patient whose history is herewith attached, but it was too late to include the report in that article. The patient came under my observation in the early part of June and was the direct cause of the cadaver work which led up to the operation I proposed in the article to which I have referred. The patient, however, refused operation at that time and returned only when his symptoms became unbearable. I am greatly indebted to Dr. R. S. Patillo, Dr. A. A. Goldsmith and Dr. Julius Grinker who referred the case to me. Dr. Patillo made repeated observations upon the eyes and his report with that of Dr. Grinker will be found attached.

The practical experience gained in this case, serves only to emphasize the deductions made in the previous contribution, viz: that tumors of the pituitary body can be reached most easily by an infranasal route. In my previous contribution I discussed the various routes used by the individual operators and drew attention to the fact that those passing through the nose (von Eiselsberg, Schloffer, Hochenegg, Löwe and others) proposed a supranasal route, and in contradistinction I suggested an infranasal route which I had worked out upon the cadaver.

The technical procedure is not especially difficult if one has familiarized himself with the various landmarks. The supranasal route necessitates extensive removal of the intranasal structures as well as disfiguring incisions upon the nose which in the first instance favors a meningitis and in the second, offers the possibility of considerable deformity, while by using the method I have suggested, the scar left in my patient is absolutely unnoticeable to ordinary observation even at three weeks after the operation, and the nose is unaltered in shape and position. The turbinates and ethmoid cells were untouched and except for the subsequent local infection engendered by the nasal pack, and the hæmorrhage met with while the tumor was being removed, the operation presented no difficulties.

A post-operative consideration of these dangers leads me to suggest that the safest procedure in these cases would be secured by a two-step operation. The first stage should comprise the removal of the bony septum and the anterior wall of the sphenoid cells. The middle turbinates may also be removed if they seem to obscure the field. This can all be done without any skin incision. After the field has entirely healed, the second stage dealing with the sella turcica and the tumor can be carried out. It may not be impossible to do this without any skin incision after our knowledge of the operation and its post-operative sequelæ are better known.

In relation to this latter, another factor has been brought into consideration by the later investigations into the physiological properties of the secretion of the gland. Dr. A. E. Halstead has suggested that we do not know what the effect may be of the absorption of the excessive amount of secretion freed in the operation. It may explain the high temperature and collapse noted in some cases subsequent to operation.

HISTORY OF THE OPERATION

The patient was given urotropin for three days preceding the operation with the hope of lessening the chances of infection and was also given as much fluid as possible by mouth, before and after the operation, as there were a few granular casts in the urine.

There was no difficulty experienced in the administration of the anæsthetic, which was first given by mouth and then continued per rectum

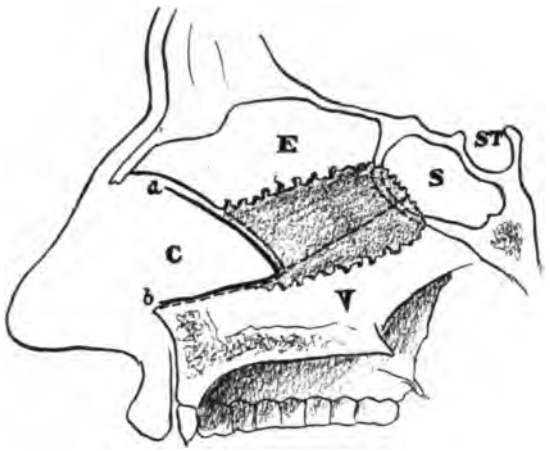

Fig. 1. Drawing showing plan of approach.

by Dr. James Churchill, after the method suggested [1] by Drs. Besley and Churchill. An absolute essential in this method is the complete evacuation of the intestinal canal, which should be begun two days before the period of operation. Smoler, in a recent issue of the Wiener Klinische Wochenschrift, reports a case which ended fatally, due to a pneumonia, and he is led to advise a preliminary tracheotomy for the administration of the ether as has already been done by others. Rectal anæsthesia precludes this danger and in the hands of Dr. Churchill has proven both safe and satisfactory in over seventy-five patients.

Shortly before the anæsthesia was begun the nasal cavity was packed with strip gauze saturated with adrenalin. This should be so thoroughly done that the gauze reaches back to the sphenoid foramina.

In the present case, when the nasal adrenalin saturated gauze pack was removed, preliminary to the incision, the nasopharynx was plugged by a gauze pack attached to a string after the usual method of inserting a posterior nasal plug. It was then pushed in tightly above the soft palate by the finger, inserted through the mouth. This controlled perfectly the escape of blood into the mouth and it was not necessary at any time to pay any attention to the pharynx.

The skin incision was made U shaped carrying the cut close under the alæ and close to the nose on the upper lip still preserving the anterior choanæ. As a result in healing, the scar contracted into the crease on either side and close under the nose and could hardly be discerned to ordinary inspection. The upper limit of the arms of the U extended only to the end of the crease made by the junction of the alæ with the face.

With a periosteotome the lower part of the nose was then separated from the bony nasal opening, it was still held in position, however, by its septum. A Ballinger knife was inserted and the cartilage cut from its attachment to the vomer and the perpendicular plate of the ethmoid. The nose was now turned up and held in position by a Jansen's mastoid retractor. It was not found necessary to remove the middle turbinates as I had anticipated. The lower part of the perpendicular plate of the ethmoid and the upper part of the vomer were bitten away by a bone forceps. The openings of the sphenoid cells were then located with a probe, the left cell opened by a chisel, and the anterior wall removed by a Hajek-Schmitheüsen punch forceps. The abutting nasal septum was removed with a biting bone forceps and the right cell then opened in like manner. Technically the procedure was most simple, although we were slightly bothered by blood running back into the field of operation, especially when the bony wall was removed, and in another patient I should be inclined to operate with the head elevated so that the operative field would not be the most dependent point.

The field of operation was found to be ample and clearly defined. The white posterior wall was plainly seen and even the angle shown by the X-ray plate was plainly evident. The distance from this point to the bony entrance as shown on the X-ray plate, had been previously marked on my chisel and this measurement corroborated our judgment as to the relations. This X-ray plate made by Dr. O'Donnell at the Michael Reese Hospital was of invaluable aid, and no operation should be attempted without such assistance. (See Fig. 2.)[2]

The chisel was directed against the lower part of the sella turcica and a slight blow carried it through the wall onto the tumor. The lower part of the anterior wall was then picked off by forceps and the floor removed by the chisel. Only slight hæmorrhage followed this procedure; not enough to be of any consequence if the head had been elevated to allow the small amount of blood to flow away from the field instead of into it. The bulging tumor appeared, being forced into the opening. A small, sharp spoon curette now entered the tumor mass and scooped out the bulging part. This was accompanied by considerable hæmorrhage, not alarming, but enough to obscure completely the field and necessitate working blindly. By packing and curetting alternately, however, a tumor mass the size of a large marble was removed. At the latter stage of this procedure the hæmorrhage became so profuse that the site was packed with strip gauze. The second hæmorrhage was apparently from some venous channel while the earlier one undoubtedly came from the tumor mass. The tumor hæmorrhage was explained later when the pathological examination showed the neoplasm to be a very vascular malignant growth.

Other strips of gauze were packed into the nasal cavity and all brought out through the anterior choanæ. The nose was then sutured in proper position by horse hair.

Post-operative course. The after course of the case as shown by the chart is in general as follows: In the first twenty-four hours the pulse varied from 54° to 72°; the respiration 16–18; and the temperature 97.6° to 100°. During the night the posterior nasal plug which had been left in came out during a coughing spell and was removed by the nurse.

The patient was somewhat soporose for the first three days. On the second day the temperature rose to 103.2°, the pulse and respiration being slightly increased; and on the third day it reached 104°. From this time it gradually fell, so that on the sixth day it was varying from 99° to 100.3°, and remained at normal until the twelfth day.

From the third day the patient became much brighter

[1] The Quarterly Bulletin of the Northwestern University Medical School. March, 1909.

[2] It is hoped that more definite data concerning the anatomical relations will be furnished by investigations now being carried on in the anatomical laboratories of the Northwestern University Medical School.

than before the operation, slept only the normal number of hours, although previous to operation he slept or was soporose most of the twenty-four hours.

The face was considerably swollen. This however also subsided by the end of the week, with the exception of the right eye which remained somewhat œdematous. The amount of vision seemed to be about the same during the after course as before the operation, although the patient himself stated that the vision was better in the left eye. The right eye, which was blind before operation, remained unchanged.

By the fifth day all of the gauze was removed from the nose except the piece directly down on tumor. An attempt was made on the ninth day to remove this but it was followed by considerable hæmorrhage and it was replaced. This attempt was followed in two days by a chill and a rise of temperature to 103.6° which gradually subsided in two days to 100°, and remained at about that stage for several days. There has been no evidence of meningitis or sinus thrombosis at any time, but at the end of two weeks the soporose tendency became more noticeable, so that at two and a half weeks after the operation, the patient's wife stated that he slept then about as much as before operation.

The urine being examined at this time showed numerous hyaline and granular casts with a trace of albumen, and the amount varied from eight to twelves ounces daily, in spite of the large amount of fluids the patient was taking. The question arose as to the cause of the soporose tendency, whether it was due to uræmia or a rapid return of the tumor. Dr. Grinker and Dr. Stubbs who saw the case with me, were inclined to the view that it was due in large measure to the growth of the tumor. In this decision, considerable weight was given to the facts that we now knew that it was a sarcoma and also that it had grown very rapidly before the operation, the rapid loss of vision and severe change in the symptoms and signs, all coming on within less than a month before the operation. The question of a second operation was considered, but owing to the tumor's rapid growth it was thought to be inadvisable.

A note made a month after the operation states the patient shows a steady increase of the soporose tendency, although he answers questions rationally when aroused. He has shown delirium on one or two occasions and is evidently slowly pursuing a downward course. His temperature is normal, he takes food freely and, except for his soporose tendency would be considered to be in good condition.

The patient died one week subsequently and, unfortunately, a post-mortem could not be secured.

PATHOLOGICAL REPORT

The tumor tissue removed at the operation was submitted to Prof. F. Robert Zeit of the Pathological Department of Northwestern University Medical School for his opinion, and his report is as follows:

"The fragments of tissue from a tumor of the hypophysis, submitted to me for examination, show an entire absence of the normal histological elements of hypophyseal tissue.

"The tumor consists principally of large round cells, 8 to 10 μ in diameter, with large vesicular nuclei, rich in chromatin, of embryonic type. Here and there some spindle cells with large egg-shaped nuclei are seen. The blood-vessels traversing the cell masses have no muscularis or adventitia. Between the cells a very delicate reticulum of fibrilar basement substance is seen everywhere. The tumor cells are, for the most part, packed closely together. Some have two vesicular nuclei: karyokinetic figures are seen in some of the cells.

"Diagnosis: Large round cell sarcoma."

I wish to acknowledge my great obligation to Dr. F. Gurney Stubbs and Dr. H. M. Richter who assisted me in the operation. At my request, Dr. Stubbs in his capacity as rhinologist examined the nose some days after the operation and reported as follows:

"In examining the case of Mr. Olsen, operated on by Dr. Kanavel, on the fifteenth day, I find conditions as follows:

"The external wound entirely healed and scar scarcely noticeable. Anterior choanæ normal, cartilaginous septum restored to median line and the union complete where it had been severed along its lower attachment. The anterior edge of the perforation in bony septum clearly discerned and somewhat movable. Small piece of cotton packing remaining in the sphenoid cavity easily seen and manipulated equally well through either naris. The lower turbinates had not been disturbed during the operation. The middle turbinates seemed apparently uninjured by the trauma of the operation. They were in normal position and only lacked their anterior ends; in other words, the nose seemed to be in almost as good condition as before the operation, minus the resected part of the bony septum.

"Externally the nose showed absolutely no signs of an internal operation."

CLINICAL REPORT (Grinker)

For permission to study and report this interesting case I am indebted to Dr. R. Patillo and Dr. A. A. Goldsmith, both of the Chicago Post-Graduate Medical School.

Summary of Symptoms: Male, aged 43, with negative family and personal history, develops short fainting spells, accompanied by disturbed vision in the form of black spots before his eyes. Somewhat later dull headaches appear at irregular intervals, interspersed, however, with occasional severe cephalalgias, of sufficient intensity to prevent sleep. Still later there occur dull pains and drawing sensations in bones and joints. In March, 1909, visual disturbances of a progressive character become more pronounced and eventuate in distinct bitemporal hæmianopsia. There also appears apathy, somnolence, and general mental and physical asthenia. Then remission of subjective symptoms for a period of three months. Thereupon recurrence of symptoms; this time, however, with vasomotor disturbances, progressive blindness and complete loss of vision in the right, with partial nasal vision only remaining in the left eye.

CASE. Patient, a carpenter, aged 43, first came under my notice June 4, 1909. In April of the same year he sought relief for eye symptoms in Dr. R. Patillo's clinic, who, having recognized the case as one of great medical interest, referred the patient to Dr. A. A. Goldsmith's medical clinic. The diagnosis of probable tumor of the hypophysis having been made, Dr. Goldsmith kindly placed the case under my observation.

Family history. Father and mother died at 74 and 76 years, respectively. Grandparents reached old age.

Fig. 2. X-ray photograph of patient's skull taken before operation. Notice the large size of the sella turcica which is outlined by the white line and indicated by the arrows.

There are still living and healthy three brothers and two sisters; none died.

Past history. Patient was well until 13 years ago when he had an attack of gastroenteritis lasting one week. No recurrences. About eight years ago he suffered from acute articular rheumatism, which disabled him for about four months. His habits were exemplary in every respect; he never drank nor smoked to excess, but was always a moderate user of snuff tobacco. He never sustained a serious trauma, nor was he ever a subject of venereal disease.

Present illness. After a searching inquiry it seems probable that the beginning of the present trouble dates about one and a half years ago, though characteristic symptoms, from a diagnostic point of view had made their appearance only within the past eight months. As the earliest symptom in this case I regard what the patient described as repeated "fainting spells" lasting but a few moments, during which he usually perceived black spots before his eyes. During the past year dull headaches were frequent and for a period of seven months intense cephalalgias alternated with the milder headaches, the former often preventing sleep. Additional symptoms noted since the advent of the severe headaches were, drawing sensations and peculiar discomfort in bones and joints; further, well-marked apathy and tendency to sleep more or less continuously. The patient himself described his pains as rheumatism and the somnolency as sleeping spells.

About the middle of March, 1909, he experienced marked losses of vision; objects appeared blurred and indistinct and he had a sensation as though he was looking through smoke. Indeed, he is certain that for a short period he was entirely blind in both eyes, but imperfect vision slowly returned and then remained stationary. In describing the eye symptoms he placed no emphasis on any existing differences between the outer and inner fields of vision.

On the part of the mental functions the only complaints were a certain degree of inability for sustained mental con-

centration and a marked reduction in his ability to remember recent events.

Examination. The appearance of the well-developed man, weighing 177 pounds and measuring five feet ten inches, with a large face and head, sluggish movements and slow speech, suggested at first the picture of an acromegaly case. However, an examination which included careful measurements, found hands and feet of normal dimensions. The face seemed a trifle long, the forehead, superciliary ridges, nose, and ears appeared rather more prominent than in the average individual. There was also a slight degree of prognathism, but no widening of the interdental spaces,— a sign first minutely described by Dr. W. W. Graves as indicative of incipient acromegalic enlargement of the maxillary bones. The tongue was not hypertrophied, but speech was of low pitch and monotonous. There was no dribbing of saliva, no kyphosis, and no enlargement of the upper end of the sternum, nor any dullness over the same. The sexual organs were normal in development and function. From these findings, both positive and negative, one is justified in concluding that there was a mere suggestion of acromegalic disturbance in our patient.

An examination of the viscera disclosed nothing abnormal in heart, liver, kidneys, spleen, and intestinal tract. Blood and urine showed nothing pathological. The blood pressure was within normal limits, though the pulse was rather slow, ranging in frequency from 50 to 60 beats per minute. The glandular and osseous systems were free from suspicious swellings.

Nervous system. Irritative motor phenomena, such as tremors, choreiform movements, twitchings, nystagmus, were absent. There were no motor palsies or paralyses of any kind. All of the reflexes, both superficial and deep, approximated to normal values. General sensation was not affected in any of its qualities. There were no disorders of co-ordination, nor of equilibration. No signs of anarthria, dysarthria, or aphasia could be detected. Neither polyuria, polydipsia, nor polyphagia was present. Mental tests failed to prove any abnormalities.

With the exception of the visual apparatus, the special senses were in no wise affected. The pupils responded well to the light test and also in accommodation.

The opthalmoscopic examination revealed a general whiteness of both disks, with distinct definition of their borders. To my non-opthalmologic eye there were not discernible any differences in the degree of optic atrophy of either half of the fundus. Evidences of a past or present papilledema, or choked disk, were certainly wanting. A rough functional test revealed the existence of blindness in the outer field of each eye (bitemporal hæmianopsia), also a marked narrowing or contraction of the nasal field of the right eye for colors and objects.

An excellent radiogram taken in Dr. Max Reichmann's Roentgen laboratory, showed distinct enlargement of the sella turcica.

Further observations. For a period of three months from the time of my first examination the symptoms remained practically unchanged. As the headaches, previously so annoying to the patient, became less frequent and less intense, it was hoped that the disease had probably become stationary. Partly in order to determine the advisability of operation and partly for the purpose of stimulating research into the best methods of approach to the hypophyseal region, the patient was subsequently placed under the direct care of Dr. Allen B. Kanavel.

Fig. 3. Photograph of patient taken two and a half weeks after operation. Notice the absolutely perfect outline of the nose and the absence of any scar.

While the remission of subjective complaints continued, neither patient nor physician were very urgent in advocating operative procedures. But, as in many another case recorded in the literature, the remission proved to be only temporary. Headaches again became frequent and severe, aching in the long bones reappeared and, what was worse, vision began to fail even more rapidly. So rapid indeed was this downward course, that on the occasion of my presentation of the patient before the Chicago Medical Society in October, 1909, I was surprised by the discovery of an enormous shrinkage of the right nasal field.

Additional notes made November 10, 1909, that is, two days before operation: Vision in right eye, both temporal and nasal, completely lost. In the left eye there remains vision in part of the nasal field only. Headaches and general aching of limbs are continuous, though not severe. Memory poor. Mentality sluggish; has occasional difficulty in finding words to express routine desires. Has become impatient and irritable. Drowsiness is now constant, although the patient can be readily aroused. Additional symptoms not previously noted are, recurring vasomotor disturbances in the form of profuse sweatings and coldness of extremities. Repeated inquiry failed to elicit any positive information relative to the previous existence of any form of tumor in his ancestry or his own person. The only statement which may possibly have some bearing on this question was that in April of this year he had suffered from an attack of tonsilitis and that his left tonsil was amputated when the inflammation had subsided. Is it not possible that the diseased tonsil was the seat of a sarcomatous growth, primary or secondary? As I have been unable to obtain definite data, this will probably remain an unanswered question.

EXTENSION BY MEANS OF THE NAIL

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THE extension by means of adhesive plaster, as recommended by Bardenheuer, is being more and more recognized as the standard method of treating fractures of the limbs.

We employ it at least in cases of dislocated epiphyses as early and as energetically as possible, and are almost always satisfied with the results obtained.

There are, however, cases, viz., complicated fractures with extensive laceration of soft parts in which the adhesive plaster extension cannot be used at the outset, or where its continuous use is impractical on account ot accidental pathological conditions such as erysipelas or phlegmon, intercurrent diseases, pneumonia, delirium, etc., or cases which do not promise good results, such as old fractures with marked contraction of the soft parts, or, lastly, in those which for any reason sufficient extension cannot be brought to bear, be it because local conditions are not favorable (fractures of the ankle-joint with marked dislocation of lower fragment of femur, arm, etc.) or be it that the treatment instigated by the first physician who saw the case has fallen short of a perfect result.

In many of these unfavorable cases in which well known methods of extension have been insufficient the nail extension method, first reported by Codivilla of Bologna, and now recommended by Steinmann of Bern, will bring about good results.

It is a valuable adjunct to the extension method and its application especially to linear dislocations seems to be of greatest importance.

TECHNIQUE OF NAIL EXTENSION

By this new method the weight is attached directly to the distal fragment by means of a nail which is driven through the bone; the nails are either angular or flat and 4.20 cm. long.

One may drive a nail into the bone on either side, or drive one nail entirely through the bone and soft parts, or as Becker recommended, drill through the bone allowing the drill to remain, the extension being applied to the ends of the drill as they project from either side.

One nail or drill is better than two smaller nails, for the reason that the smaller ones become loose from absorption of bone.

The drill is passed through the spongy portion near the epiphyseal line, the nearer the compact bone the better, as less pressure atrophy results than when the drill is entirely within the spongy portion.

In fractures of the femur the drill is passed one handbreadth above the line of the joint, in fractures of the leg below the knee, either through the tibia or os calcis.

Codivilla and later Kirschner recommended that the drill pass through both fragments in order that counter extension may be applied directly upon the fractured bone, thereby avoiding any traction upon a joint. The result of the extension can be retained by placing a plaster bandage between the nails, which impinges upon them and does not allow them to approach each other when the weights are removed.

I have so far found it necessary only in fractures of the femur to employ extremely heavy weights. The hip-joint supports sufficient counter extension, but in fractures below the knee I should recommend if heavy weights are to be used, that nails be placed both above and below the fracture, because the knee-joint does not well withstand such extension.

We have employed the electric motor, others recommend the hand drill. The operation can be easily done under local anæsthesia.

In order that the cords which bear upon the drill may not slip off, some provision should be made, such as screwing a nut upon either end. See Fig. 1.

As to how much weight one must at first employ, it is difficult to determine; in fresh fractures much less is required than in old ones.

We begin with smaller weights and gradually increase them during the first or second day, carefully and frequently controlling each individual case.

We have frequently observed a diastasis of the fragments, which in itself amounts to nothing, as the fragments return to apposition as soon as the weight is lessened.

In fractures of the femur we, as well as Steinmann, have found 15 kilo (32 lbs. approx.), for fractures below the knee 10 kilo (26 lbs. approx.), sufficient.

At times we have used 25 kilo. When, by the

Fig. 1. Nail extension in complicated infected fracture of the leg.

prolonged action of heavy weights the linear dislocation has been corrected and callous formation begun, the heavy weights may safely be replaced by lighter ones.

Moreover, lateral dislocation and bending can be corrected by placing more weight upon one side or the other, or by slipping the cord out near the end of the nail, using it as a lever. It is, however, better to keep the cords closely applied to the limb, thereby avoiding the possibility of breaking the nail and, if necessary, apply lateral weights either direct as shown in Fig. 2, or acting over a pulley in the desired direction.

ADVANTAGES AND DISADVANTAGES OF NAIL EXTENSION

The general use of the method will depend upon the weight of argument for or against it. On the face of it it seems cruel and dangerous. To most everyone, ourselves included, the method a priori seems productive of much pain to the patient. As a matter of fact this is not so. Not one of our patients has complained more than the ordinary patient who has the adhesive plaster extension applied. Children also complain little of the treatment. It is certain that the pain produced is in no way a contraindication to its employment.

The greatest consideration is in regard to the danger of infection. In the light of modern views on asepsis and infection some anxiety may be rightfully caused by driving a nail through the skin into the bone or entirely through the limb and allowing it to remain for weeks.

It was with trepidation and fear that we first employed the method in a case in which it seemed impossible to bring about a good result by ordinary methods, but we are now convinced that the danger of infection is very slight, much less than it a priori appears. However, the danger from infection is not to be denied. We had one slight infection at the site of the nail.

We do not employ nail extension in fresh uncomplicated fractures, especially when the nail must necessarily come near the hæmatoma. An unfortunate case of Schwarze's proves that secondary infection of the site of the fracture may occur.

The direct results of the traumatism are allowed to subside before the nail extension is applied, and we are convinced that cases, weeks after the injury, are still amenable to the treatment.

Since there is a danger from infection, we cannot at this time recommend that the nail extension should be generally used without strict indications for it. Further, on account of lack of sufficient experience, we cannot say whether the joint function may or may not be interfered with by the nail's proximity to it.

However, as in all our cases, when it seemed that by the use of other methods a faulty healing must result, we are justified in choosing between the

Fig. 2. Fracture with posterior dislocation of the foot.

two evils, viz.: Possibility of infection and the possibility of a transient limitation of motion in the joint, in order to give the patient the benefit of the advantages of the nail extension. There are few other contraindications.

The advantages, however, outweigh the disadvantages, and foremost of these is the fact that the extension comes only upon a small portion of the lower fragment leaving the rest of the limb free. Furthermore, it allows of an energetic extension in cases of complicated fracture (see Fig. 1), which by other methods is impossible.

The second and most important advantage is that the method is not confined to the treatment of fractures, but may be employed generally in surgery of bone where it allows the application of great force when necessary.

In this relation it overcomes most satisfactorily within a few days the contracture of the soft parts, so frequently seen in old fractures, an obstacle which was before held as insurmountable.

The number of my observations is not great, only twenty cases, but in all of them there were direct indications for the nail extension, either where the customary adhesive plaster extension was impossible of application or where it failed to bring about the desired result.

I venture to assert that my results may have some worth and may be of general interest.

The cases group themselves into five groups.

GROUP 1. FOUR CASES OF OLD FRACTURES WITH PSEUDOARTHROSIS AND DELAYED UNION

M., 26 years old. Fracture leg below knee. Accident October 13, 1908. Admitted eight weeks later. Both bones broken, middle, and very movable. Shortening 4 cm. Œdematous. (See Fig. 3.) December 11, 1908, in narcosis, mobilized. Extension upon nail driven through both bones above malleoli. Ten pounds put on immediately, which in the evening was increased to twenty. No pain. (See Fig. 4.) December 12, 1908, lateral pressure. December 14, 1908, shortening completely overcome, ends of fragments in contact, but some lateral displacement. December 21, 1908 (ten days), position satisfactory; beginning consolidation. Has had no pain. January 2, 1909, nail withdrawn; skin wound free from irritation. Point of fracture elastic, massage, mechanotherapy. February 14, 1909, discharged healed, callus hard, no shortening. (See Fig. 5.)

Beside this were two cases of pseudoarthrosis of the femur with 4 and 10 cm. shortening, respectively, whose accidents were four months previous.

These were treated with nail extension with thirty pounds weight. After four weeks the one had elastic callus which in two weeks more was completely solid. The other, with 10 cm. shortening, was completely corrected but still had a pseudoarthrosis because some soft parts interposed; these were removed by operation. Discharged healed, with only 2 cm. shortening.

After such good results in the first two cases, and the favorable one in the third, I consider the nail extension a great help in the treatment of pseudoarthrosis and recommend its trial before a bloody operation be attempted, especially as it was seen in this case that it placed the fragments in a more favorable position for the cutting operation.

Fig. 3. Fig. 4. Fig. 5.

The following case is of particular interest:

A frail man of 63 years, suffering from a fracture at the lower third of the femur, was treated by means of adhesive plaster extension, but on account of pneumonia with pleurisy and weak heart the plaster was removed after three weeks. This resulted in a shortening and bad position of the fragments. The adhesive plaster was again applied, but to no avail, therefore nail extension was substituted. After nine weeks the callus was springy but quite solid; no shortening, but some lateral dislocation.

Everyone can call to mind similar cases of fracture with dislocation in which, on account of some intercurrent malady,— delirium, erysipelas, pneumonia, or injury — the adhesive has been removed for some weeks, after which a poor result, such as shortening, faulty position of the fragments, or delayed union has occurred.

In such unavoidable and unhappy cases the nail extension seems to be of especial value. It is hoped that we can by this means give a better prognosis in cases of old fracture with delayed union.

GROUP 2. FIVE CASES OF COMPLICATED FRACTURES

The nail extension was of great advantage in a case of complicated fracture of the leg below the knee in which the skin wound was dirty, the bone fragments were exposed, and immediate treatment was a necessity.

In this case the nail extension was particularly advantageous because the local conditions allowed only a small space upon which means of extension could be attached. Energetic extension in this case being at this time secondary in importance, Fig. 1 shows how simple and secure the management was.

Fig. 6.

Fig. 7.

In another case it was possible to employ it in spite of a phlegmon in the leg. The linear dislocation was corrected, but on account of intervening soft parts the lateral dislocation remained even after many trials during which the ends of the bones were separated from each other (diastasis).

The nail extension was also of great benefit in a double fracture of the humerus with a complicated fracture of the forearm.

This case recalls to mind many complicated fractures of the leg above and below the knee which resulted badly simply because of a lack of normal skin upon which the adhesive could be applied.

Usually in such cases one waives adaptation of the fragments and directs his attention to the treatment of the wound, using either a simple splint or an open plaster cast.

Many times one resorts, even under the unfavorable circumstances, to bone suture only to bring the fragments more closely together. The employment of nail extension offers two possibilities which tend toward a better prognosis in severe cases of complicated fractures.

When the case permits of it, the nail extension is immediately applied and does not in any way interfere with the treatment of the wound.

Secondly, when the local conditions do not permit even of the nail extension the wound can be treated in a simple splint or cast and later, when the skin wound has healed or at least much improved, the nail extension can be employed for the correction of the deformity.

We believe that the shortening in the most severe cases, even after the removal of a large sequestrum, may be avoided. The excellent results shown in group 4 seem to warrant this belief.

GROUP 3. RECENT FRACTURES WITH UNSATISFACTORY RESULTS OF CUSTOMARY TREATMENT. FOUR CASES

This group comprises four cases in which the adhesive plaster would not permit of sufficient local conditions (excessive fat development in a weights being applied on account of unfavorable case of fractured femur, fracture of ankle-joint with dislocation, and fracture of leg below the knee).

It is of great advantage that the nail extension can be applied at most any time, rarely is it too late.

In the case of a very corpulent man with a fracture at the lower third of the femur, it was impossible, in spite of fifty pounds weight with lateral pressure, also several trials in narcosis, to correct the shortening.

Such a case is usually treated very satisfactorily by the method of Bardenheuer. Nail extension was employed, the weight being gradually raised from twenty to fifty pounds. A diastasis of one-half cm. resulted. It was found that thirty pounds was sufficient to retain the fragments in position, after five weeks the fracture was healed, with a slight posterior displacement of the lower fragment, but no shortening.

In a fracture of the internal malleolus with fracture of the anterior border of the tibia, a splitting of the astragalus with right angular dislocation of the fragment and forward dislocation of the foot (see Fig. 6) it was impossible, by ordinary methods, to reduce the fragments. A nail was driven directly through the astragalus upon which energetic extension was applied, and the fragments resumed their normal positions in which they were easily held. (See Fig. 7.) The procedure resulted in a functional cure with good movement of the joint, which, from the severity of the case, at first seemed impossible.

In another case of fracture of the ankle-joint with severe backward luxation of the foot, we at last used nail extension. Fig. 2 shows the manner in which the weights were brought to bear. In our opinion the most important point is the employment of great weight for extension and this case could have been handled by no other method as well as by the nail extension, the nail being driven through the os calcis.

Codivilla recommends this procedure for fractures higher up. I doubt if this spongy bone is able to withstand the weight necessary for fractures of the femur for the sufficient length of time.

In one of our cases, the nail, by pressure atrophy, passed through the bone, however, without following disturbance of function.

GROUP 4. THREE CASES OF OLD FRACTURES WITH BONY UNION AND DEFORMITY

In order to correct the deformity one must first resort to osteotomy. Our method is to approach the callus from the side, protecting the muscles, after partially sawing the bone, produce a spiral fracture by torsion, which with the chisel as a lever is easily accomplished. The bone is then drilled through and weights added under careful control of the blood-vessels and nerves.

The following case is of great significance:

On the 27th of July, 1908, a boy of 16 years met with an accident, being run over, and suffered a complicated

fracture of the femur; the wound of the skin and soft parts was dirty and wide open, the bones and large vessels lay free in the cleft, there was also an epiphyseal separation at the lower end of the tibia. Septic fever. Ordinary extension. On July 29, 1908, an attempt to suture the fragments was made; limb placed in splint; again high fever. Large gangrenous masses and a total sequestrum 5 or 6 cm. long were thrown off. The limb was fixed in an open plaster Paris splint. Gradual healing in poor position with shortening, discharged in plaster Paris splint.

September 5, 1909, returned with varus of femur, shortening of right leg 15 cm., of which about 3½ cm. was from the tibia. Knee stiff, some lack of motion in ankle-joint. (See Fig. 8.)

September 26, 1909, osteotomy of the callus after the artery and vein were freed from the scar tissue which was fast adherent to the bone. Drill inserted through femur about a handbreadth above line of knee-joint. Extension of about 11 pounds increased to 30 pounds applied. Much pain, for which much morphine was necessary.

October 26, 1909, beginning consolidation. Still some shortening. Mobilized in narcosis and 11 pounds again put on for extension. November 1, 1909, callus again hard. November 15, 1909, nail easily removed. Shortening 4 cm. Femur of nearly normal length. November 20, 1909, skiagraph shows nearly a normal femur. (See Fig. 9.)

It is interesting to note that after the removal of a sequestrum 5–6 cm. long, which resulted in a shortening of 11 cm., the configuration of the bone after the nail extension was nearly normal.

I hope after osteotomy upon the likewise shortened (4 cm.) tibia to restore its normal length, which beautiful result without the nail extension is impossible.

This case may be taken as an example showing how much better the prognosis in severe complicated fractures may become under the new method.

In another less severe case of completely healed fracture of the femur with 3½ cm. shortening, viz.: a cavalry officer whose injury was four and a half months previous, an osteotomy and nail extension procedure was undertaken, with the result that not only was all shortening overcome but also a genu valgum corrected, which condition preceded the fracture. The nail remained in place four weeks. At first thirty-five pounds was applied, and after some hours fifty pounds. After eight weeks the callus was hard, and he walked about with the aid of mechanical help. (Mechanotherapy.)

GROUP 5. FOUR CASES IN WHICH OTHER USES OF THE NAIL EXTENSION WERE MADE

The nail extension was used in a case of old posterior luxation of the shoulder with fracture of the tuberosity, which could in narcosis be reduced but would not stay in place. (Two small nails were driven into the radius and ulna.) It was also used in a luxated femur.

The following case seems to be of greater surgical interest, as it prompted us to undertake measures for correcting the shortened bones.

The observation of diastasis of the fragments during nail extension in fractures of the femur led us after chiseling through the femur to employ the method with a view of lengthening the bone.

Fig. 8. Fig. 9.

CASE 10. Ten year old girl. Shortening of leg 10 cm., due to a large ecchondroma involving lower end of right femur and upper part of tibia. Varus and lack of development. Tumor, which was well marked in skiagraph, was removed at several sittings. Upon admission to the clinic in March, 1909, shortening was 10 cm. (9 cm. in femur, 1 in tibia). Femur sharply convex. Knee-joint limited in flexion with abnormal lateral motion.

March 11, 1909, operation. Step-like saw-cuts 8 cm. apart. Bone separated between saw-cuts. (See Fig. 10.) Bone marrow macroscopically normal. It was possible, by manual manipulation, to separate the ends of the bone only 1½ cm. Primary wound closure. Femur drilled through handbreadth above joint line. Drill allowed to remain. Ten pounds extension. In order to control the direction of force a light adhesive plaster extension was made upon the leg below the knee. Under careful control of blood-vessels and nerves, on the 13th, fifteen pounds was applied, on the 17th, twenty-one pounds, later in the day, twenty-four pounds. On the 30th, bones in good position. Skiagraph showed 9–10 cm. lengthening with beginning callus building. April 26th, nail extension removed and adhesive plaster supplemented until May 20th. Position good; callus hardening. June 8th, allowed upon feet with a Thomas splint. Discharged. Bones in good position with 2 cm. shortening. Result, leg has been lengthened 8 cm. Patient can lift leg very well. July 3d, consolidation increased; shortening 2 cm.; discharged in a Thomas splint.

The attempt to lengthen bones by means of oblique osteotomy has often been made, but I know of no case in which such a good result has been obtained as in the foregoing one.

This excellent result prompted me to attempt to correct a much shortened leg with club foot in which an osteoplastic ankle resection after Waldimiroff-Mikulicz had been done.

An osteotomy with step-like saw-cuts was done on the tibia, and by means of nail-extension a lengthening of 3 to 4 cm. was attained. The

Fig. 10.

Fig. 11.

result is not entirely satisfactory, because at least 3 or 4 cm. was lost by the (extirpation of the astragalus) bolting of the joint. The patient now does not need a complicated mechanical device, only a thick sole.

There is a large group of cases which I wish to point out as being amenable to treatment by nail extension, although I have none such to report, viz.: gunshot fractures, especially splintered fractures with severe injury to the soft parts; in time of peace when such cases come singly and there is time to carefully treat them less than in time of war when the cases are increased, as in an epidemic. Later experiences have again pointed out the truth of the principles upon which von Bergmann based his treatment of gunshot fractures. The simple immobilization in a plaster cast has been of inestimable value in hundreds of cases, but it influences the result in severe dislocations by the unavoidable shortening which occurs.

When one immobilizes the parts in spite of the unavoidable shortening which results it is in order that infection and disturbance of wound-healing may be avoided.

On the other hand there are often many reasons why a complicated extension bandage cannot be employed or cannot be continued throughout the case if it is applied.

We believe that in these many cases the nail extension will be found to be of great service. It allows, best of all, the practice of the ground principles of surgery in such cases, the waiting until active inflammation has subsided, then two or three weeks later the dislocation — at least the linear dislocation — may be reduced.

It is important that further observations be reported. After all with all its advantages it is not entirely free from danger, and cannot at this time be recommended as a routine practice in dislocated fractures.

It requires careful control and observation. It is therefore not intended to replace the established methods of extension, but it is to be reserved as a valuable complement in cases in which for any reason other methods are less applicable.

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APRIL, 1910.

OPERATIONS FOR BRAIN TUMORS[1]

In considering operation for brain tumor we should bear in mind that we are dealing with a lesion that must in course of time prove fatal, and usually within a short time. Tumors of the pituitary body frequently seem to be of slower development than are new growths in many other parts of the brain. Acromegaly is a condition of slow development and long duration, and while a tumor of the pituitary body is not found in every case of this disease, it not rarely seems to be the cause, and when present does not appear to hasten greatly the fatal termination. Frequently cessation of menstruation is the first sign of tumor in this region of the brain, and it may precede the other symptoms for many years. A tumor of the pituitary body may attain considerable size without causing many symptoms, and a bitemporal hæmianopsia may be its only sign for a long time. The sella turcica is enlarged by pressure from the growth, and the hæmianopsia may in this way become less by relief of pressure on the chiasm. This variation in the hæmianopsia sometimes perplexes the clinician. The third ventricle is above the pituitary body, and a tumor may grow to large size in this ventricle before it produces many symptoms. For these reasons one may hesitate before attempting to remove a tumor from this region. The operation in whatever way it may be undertaken is very serious, and while a few successful cases are on record, we can not forget the grave danger in surgical intervention. It is important to keep in mind that because of the relations referred to above, grave symptoms of tumor of the pituitary body are likely to indicate a large growth, and that operation would be much more promising if bitemporal hæmianopsia were the only sign. Bitemporal hæmianopsia may be produced by meningitis, fracture of the base of the skull, or aneurysm, but is strongly suggestive of tumor when developing slowly and without a previous trauma of the head, especially is this true if to the bitemporal hæmianopsia complete blindness of one eye be added, indicating complete loss of function of the fibers in one optic tract, or if primary optic atrophy instead of papillœdema be present. In some instances, as in a case reported recently by Gowers, primary optic atrophy may be observed on the side on which the tumor is larger, and papillœdema on the other side where the tumor is sufficiently far from the papilla to permit papillœdema to develop. In this case skilfully diagnosed by Gowers, operation was performed by so ex-

[1] Remarks made with a lantern demonstration at the annual meeting of the Medical Society of the County of Rensselaer, Troy, Dec. 15, 1909; and later at a meeting of the College of Physicians of Philadelphia.

perienced a cerebral surgeon as Horsley, and yet it resulted fatally.

Statistics as now given regarding operation in cases of brain tumor are unreliable, because infiltrating and well defined tumors are included in the same tables, and little attention is paid to the mortality depending upon the position of the tumor.

The statement that operation is more likely to be successful when the tumor is small hardly admits of dispute, but it is not always easy to make the diagnosis in the early stages, and frequently the patient is not seen by the neurologist at this period. Symptoms which to an experienced physician are very suggestive of tumor, may be attributed to gastric or hepatic disorder, to nephritis of pregnancy, or some other cause; and tumor especially of the cerebellum, may produce a condition of the retina resembling albuminuric retinitis.

It may not always be remembered that sudden death is common in cases of tumor in any part of the brain, but chiefly when the tumor is in the posterior cranial fossa. There is less room here than in any other part of the cranium for a new growth, and increase of intracranial pressure therefore occurs more rapidly, and the respiration and cardiac action may suddenly become seriously impaired.

It is wise always to present the condition clearly to those who may be responsible for the patient, and often to explain the condition to the patient himself if he be intelligent. One will frequently find that an intelligent person will demand that the chance of operation shall be given to him, even though he fully realize how serious a surgical intervention may be. He recognizes on the one hand that he has a cerebral lesion which must prove fatal, and that the end may come suddenly within a few days, a few weeks, or after a longer period; that while he lives he must suffer great impairment of function in important structures and probably great discomfort, especially in headache, nausea. and vomiting. On the other hand he knows that surgery may give him a chance for his life or for temporary relief, and he gives no choice to the physician, but demands as his right that the chance be given to him. More than once the surgeon will be told by the patient that no effort to remove the tumor is to be slighted, and that death would be preferable to a continued existence in his deplorable state.

There is no denying that the mortality in operations for brain tumors is high, but it is not so high as the mortality of tumor cases without operation, which approaches 100 per cent. Surgical technique has been so greatly improved in recent years that operations for tumors have become almost a special branch of surgery. The success of surgical intervention will depend chiefly on the correctness of the diagnosis, on the position and size of the tumor, and on the skill and experience of the surgeon. The neurologist must strive to make his diagnosis at an earlier period in the development of the tumor, and should not wait until all the important signs of increased intracranial pressure have developed, and to these are added many sharply focalizing symptoms. In the early stage of tumor general signs of intracranial pressure may be entirely absent, and there may be no headache, no nausea or vomiting, no papillœdema. A slowly developing focal symptom or focal group of symptoms may be sufficient for exploration, and this is especially true if the lesion be diagnosed as being in an accessible portion of the brain. Convulsions confined to one limb, or both limbs on one side of the body, or also to the face on the same side, and occurring repeatedly, indicate irritation of the opposite motor region of the cortex; and while the source of this irritation is not always detectable, a cause must be present. Such convulsions are not always produced by tumor, but frequently are so pro-

duced, and at least twice in the writer's experience were the only important sign of a tumor discovered at operation. The motor region is easily exposed and little damage is likely when an osteoplastic flap is made, provided the patient's general condition permits operation. The scar from this operation may almost disappear and may be detected only by careful search, even a short time after the operation. It is probably a wise procedure to expose the motor cortex when the convulsions are strictly Jacksonian in type and of frequent occurrence. Unquestionably a tumor will not always be found, but if we expect to operate early we must be prepared to take more chances than in a case easily diagnosed by a first year medical student, and yet rashness is not justifiable.

A paræsthesia confined to the distribution of the fifth nerve, followed after several months by anæsthesia in the distribution of this nerve and paralysis of the muscles of mastication on the same side, indicates a lesion paralyzing the fifth nerve. In the writer's experience this symptom-complex has been produced by basal syphilitic meningitis, but it is more likely to be caused by tumor. When the Wassermann reaction is negative and the anti-syphilitic treatment has failed, the diagnosis of a tumor in the region of the pons may be considered probable, but a negative Wassermann test does not necessarily exclude syphilis of the brain. It is not easy to determine at first whether the tumor be in the pons or growing from the dura over the petrous portion of the temporal bone. Glioma within the pons does not destroy all the area in which it develops, and trigeminal disturbance may be the most pronounced sign of glioma of the pons, but some weakness of the opposite limbs is likely to develop soon. Tumor growing in the region of the petrous portion of the temporal bone usually causes pain in the distribution of the trigeminal nerve from irritation of this nerve, but in one of the author's recent cases pain was absent. A tumor in the middle cranial fossa may implicate the bone, and in the writer's experience has extended into and partly filled the nasal cavities.

The greatest difference in symptoms may be occasioned by a tumor just above the tentorium and one just below this membrane. When below, the symptoms usually are very characteristic, and are such as cerebellar ataxia, unilateral nerve deafness with facial palsy on the same side, early papillœdema, nystagmus, vertigo and severe headache. A tumor growing above the tentorium, from the floor of the middle cranial fossa, may develop to a large size with few symptoms, if it does not implicate the trigeminal and abducent nerves. Here it forms a nest for itself in the basal part of the occipital lobe by atrophy of the overlying lobe, and as the optic radiations do not extend to the base of this lobe hæmianopsia may not be present. Papillœdema and headache may be the first signs of a growth in this region, and when the patient comes under observation the former may have attained so great a degree as to mask a hæmianopsia that had been present. The tumors at the base of the occipital lobe are very likely to escape detection when small.

The endothelioma is probably the most favorable tumor for operation. It does not infiltrate the brain, it grows from the dura and is well defined, and is less likely to recur than is almost any other form of tumor. It seems a strange perversity of nature that most of the tumors in the cerebral hemispheres, where tumor is most accessible, are gliomata; and that most of the basal tumors, and therefore in regions of greater danger, are endotheliomata. Mallory regards the tumors commonly considered as fibromata or fibrosarcomata, as endotheliomata. These tumors occasion-

ally develop over the cerebral hemispheres, and the most successful surgical cases are those in which a growth of this character is found. Endothelioma may infiltrate the overlying bone, and the hæmorrhage then from the bone is severe when the bone is cut. A distinction should be made between a slowly growing and a rapidly growing endothelioma.

In the later stages of tumor the pressure at the base of the brain may cause partial obstruction of the ventricular cavities, and hydrocephalus. The symptoms then become so indistinct and indicative of a widespread lesion that a focal diagnosis may be impossible. The tumor often is so large at a late stage when operation is attempted that it can not be removed, or if removed the patient dies within a few hours after the operation, if not on the operating table. The pathologist too often finds a tumor that should have been removed and had remained undiagnosed, and on the other hand the surgeon sometimes removes an enormous tumor which from its character and situation should have given a favorable prognosis if permission for operation had been granted earlier.

It is not easy to explain certain signs of brain tumor. Failure of light reflex and bilateral exopthalmus have occurred in the writer's experience in tumor of the temporal lobe. Again we may see improvement in the condition of a patient who has a large tumor of the brain, especially if iodid has been given. Why this occurs we do not know. The tumor has not diminished in size, indeed it may have increased in size, and yet intelligence may take the place of stupor, and hopes are raised that soon perish. Seldom do periodic exacerbations occur in such an extraordinary manner as in the recent case reported by Rudolf and Mackenzie in which they seemed to be related to the menstrual period.

WM. G. SPILLER, M. D.

THE CHEMISTRY OF CELLULAR METABOLISM IN THE TOXÆMIA OF PREGNANCY

Toxæmia of pregnancy is a term that for many years has been applied by obstetricians to a symptom-complex characterized by nausea and vomiting, headache, visual disturbances, delirium, and coma. With these have usually been associated albuminuria, with or without casts, and some degree of œdema. This group of symptoms has been regarded as taking origin in a more or less marked, if indefinite, systemic poisoning. In more recent years this term has broadened until to-day it includes hyperemesis, gravidarum and eclampsia. Incoercible vomiting is now looked upon as an exaggerated form of the emesis ordinarily thought of as physiologic, while eclampsia is spoken of as a toxæmia of the convulsive type. Indeed, Acconci has recently attempted to show, though not able to prove, that acute yellow atrophy of the liver is a consequence of a toxæmia due to pregnancy. Again, Rissman, in studying jaundice associated with pregnancy, has concluded that, while there is no jaundice peculiar to gestation, any changes in the liver in pregnancy accompanied with jaundice and toxæmic symptoms belong to eclampsia. The relation of puerperal insanity to intoxication was brought into question over two years ago by Huggins, recalling that as far back as 1857 Sir James Simpson showed that albuminuria appeared as a coincident with this mania in a large proportion of cases. Finally, in certain cases of septic infection there is reason to believe that even a mild toxæmia may so reduce the patient's resistance as to render febrile a puerperium that would have run an otherwise normal course.

Not only, then, do we find toxæmia expressed in protean forms, but as a result of wide clinical observation many teachers have come to agree with Bouchard that every pregnant woman

reveals, in some degree, evidence of auto-intoxication or toxæmia. Pathologically, the effort to divide these forms into two types, nephritic and hepatic, has not met with universal acceptance. This is due to the fact that, while the pathology has been fairly well worked out, the underlying etiological factors are as yet unrevealed. The kidney changes, varying from cloudy swelling to that appearance typical of nephritis, possess little significance, showing only one reason why the toxæmia of pregnancy bears so close a resemblance to that of uræmia. In the liver the changes are equally vague, ranging from a diffuse fatty degeneration, in mild cases, to acute yellow atrophy in fatal cases, or to typical miliary necrotic areas as in some cases of eclampsia. J. E. Welch has recently shown that these lesions are not uniform, either in mere toxæmia or in eclampsia, but he is quite certain that the hæmorrhagic areas are produced by liver and placental cell emboli, thrombi formed from blood plates and fused red blood cells and by a solution of vascular endothelium. Schmorl considers the necrotic areas in the liver as pathognomonic of eclampsia, the cell degeneration always being preceded by coagulation as a primary process. Hence there is some reason for upholding the view of Dienst, that fœtal blood, passing into the maternal circulation and acting there like blood from another species, produces various anti-bodies which are toxic and capable of producing coagulation in the maternal capillaries. Welch believes that the agent causing the hæmolysis and general cell destruction is most probably an enzyme.

Thus the study of the pathology of this complex condition has led every investigator in one direction, towards tissue metabolism and the chemistry of cell changes. Zweifel was the first of recent writers to insist upon this trend, though here, again, Simpson pointed the way in his generation. That the chemical side of this work was for so long a time neglected is due, no doubt, to the fact that obstetricians in the past have been interested more in the technical development of obstetrics, that chemical researches required a degree of technical knowledge not yet perfected, and that the changes in the urine and blood in toxæmia were supposedly analagous to those present in nephritis and uræmia. Thus for many years the kidney was regarded as the organ at fault in eclampsia.

However, following work on this subject by Gscheidlin, Spiegelberg, Voigt, Butte and Poehl, Zweifel and Zangemeister in 1904 first showed that in eclampsia a relatively high proportion of the total nitrogen took the form of ammonia salts. This increase was believed to be due to the presence in the blood of some acid in excess. Subsequently this acid was found to be lactic acid. Zweifel's reasons why convulsions are probably not due to this acid, however, are logical and his conclusions fall in line with those of Folin, whose work is most fundamental in the study of cellular metabolism. One can thus agree with Bouchard and Zweifel that the blood during pregnancy is toxic and necessarily, therefore, can regard the liver as essential in the elimination from the system of these poisons. Now, ammonia is chiefly produced in the alimentary canal, is rapidly increased with proteid digestion, and is converted into urea in the liver. Again, according to Folin, an excess of ammonia in the urine is merely an evidence of an acidosis and not of fault on the part of the liver. Since, as is well established, the total amount of nitrogen is entirely dependent upon the diet, it is only fair, so far, to say that a high ammonia co-efficient is more aptly coincident with a toxæmia than due to it.

On the other hand, the liver is an organ barely capable of performing its normal functions in ordinary health. Adding, therefore, to its burden of every-day metabolism the toxins

of pregnancy, it is but logical that the organ should undergo some degree of deterioration. In the milder toxæmias the nature of the damage done is indeterminable, but in patients dying of hyperemesis, eclampsia, and acute yellow atrophy the changes already referred to are present. That changes sufficient to interfere with normal function exist before necrosis occurs must be admitted.

Finally, more recent investigation by Ascoli, Weichardt and Veit, based upon previous deductions, has brought the research definitely into the laboratory of the chemist. The "placental theory" holds first place to-day in the etiology of the "convulsive type" of gestation toxæmia. Whether convulsions are produced when placental cells in maternal blood become too numerous for the syncytiolysins to overcome, or whether they are due to the syncytiolysins themselves, is an interesting problem. Weichardt may be right and the intoxication may be due, instead, to syncytiotoxins freed from placental cells by the action of the syncytiolysins. Yet no one of these theories is the most important thing. The real value of the work is that the solution of the toxæmia question is brought definitely within one line of research. This question in particular may seem to have become all the more complex to the obstetrician, but certainly only for a relatively short period of time. It is to physiologic chemistry that the internist and the surgeon are now turning over for solution their various problems of allied nature. CAREY CULBERTSON.

TRANSACTIONS OF SOCIETIES

CHICAGO SURGICAL SOCIETY

REGULAR MEETING HELD FEBRUARY 11, 1910, WITH THE PRESIDENT DR. ARTHUR DEAN BEVAN, IN THE CHAIR

DR. NORMAN KERR reported a case of "Growth of Bone against Resistance," and exhibited the patient. See page 396.

DISCUSSION

DR. ARTHUR DEAN BEVAN: I should like to say that this case interests me very much indeed. I have never seen one exactly like it. I have seen several cases where the fibula has been substittued for the tibia at some remote period in the history of the process. This, as I understand, was done pretty early.

DR. KERR: A month after the primary infection.

DR. BEVAN: I have seen two cases where the fibula was substituted for the tibia, but at a longer interval after the acute process. Dr. Kerr has obtained a most admirable result in this case and he has presented a plan which we can very well adopt in some of these cases.

I. CASE OF MISPLACED KIDNEY. II. INFECTION WITH THE BACILLUS ÆROGENES CAPSULATUS

BY S. C. PLUMMER, M. D.

I. CASE OF MISPLACED KIDNEY. J. B., aged 38 male. The patient complained of a swelling located in the region ordinarily occupied by the appendix vermiformis. After having been under treatment on the medical side of the hospital and discharged, he returned and insisted upon an operation to remove the tumor which he said caused him pain and total disability to perform manual labor.

The tumor was easily palpable and its resemblance in shape and consistency to a kidney was remarked. It was practically immovable. The nature of this mass was not determined, but it was thought most probably to be a displaced right kidney.

On October 13, 1909, an incision was made through the rectus muscle near its outer border and over the tumor, which was found to lie retroperitoneally and to the inner side of the ascending colon. The peritoneum over the tumor was incised and it was then seen that without doubt we had to deal with a kidney, whose lower portion lay on the brim of the pelvis.

An examination was now made as to the presence of other kidneys. Just above the misplaced kidney could be palpated, in the normal position on the right side, a kidney of normal shape, but larger than the average size. This proved later to be a normal kidney of large size. On the left side I thought I palpated a third kidney in normal position, but smaller than the average size. This proved later to have been an erroneous observation, as there was no third kidney.

Thinking, then, that I had to do with a supernumerary kidney, which caused pain and disability, and that the patient was amply provided with renal tissue without the kidney in question, I proceeded to remove it. The hilus was turned outward, that is toward the right side, and the vein and artery could be seen crossing the anterior surface of the kidney in a deep groove. The ureter passed directly downward from the hilus to the bladder. The vessels were ligated and the kidney removed. The posterior peritoneum was closed, and the incision in the abdominal wall closed without drainage.

Twelve hours after the operation, as the patient had passed no urine, a catheter was passed, but no urine found. Twenty-nine hours after the operation one drachm of urine was withdrawn by catheter. No more urine was passed until six full days after the operation when three ounces were voided. The following day he voided urine three times, amounting to five ounces in all. On each

of the two following days he passed a small amount of urine which was not measured. He died ten days after the operation, having passed not more than ten or twelve ounces of urine during that period.

During this time and up to within twenty-four hours of his death his general condition was remarkably good for a man who was passing practically no urine. Although at times emesis was frequent, he had periods when he retained considerable amounts of fluid by mouth. He also retained large quantities of normal salt solution per rectum, sweet spirits of nitre, caffeine, and potassium citrate were administered. The bowels moved well.

Three days after the operation a slight bloody discharge was noticed on the dressings, one stitch was removed and a small gauze drain inserted into the subcutaneous space. The discharge was tested for urea, but none found.

Five days after the operation a small portion of omentum protruded through the wound. The dressings had a urinous odor and were found to contain considerable urea.

Seven days after the operation a considerable amount of urea was again found in the discharge, as well as a large quantity of albumen.

Nine days after the operation a loop of intestine protruded; upon replacing this eight or ten ounces of fluid escaped, which was clear and sticky and had the odor of urine. The intestinal loop was retained by a gauze pad, covered with a strip of adhesive plaster.

The patient died ten days after the operation.

II. Infection with Bacillus Ærogenes Capsulatus. Case 1. C. J., aged 45, male. On October 23, 1909, while at work wrecking a hotel building, he was struck across the left thigh by a heavy iron beam, which fell from a considerable height. He sustained a compound comminuted fracture of the femur, accompanied by a large open wound through which could be seen extensive laceration and contusion of the heavy muscles of the thigh. Clothing and dirt had been carried deeply into the wound.

He was said to have lost much blood and was in rather profound shock. Pulse 70. Temperature 97.8.

The wound was cleansed as thoroughly as possible without the administration of an anæsthetic, and was packed with gauze wet with a 1-2000 formalin solution, without any attempt at closure, but rather with the intention of keeping it as widely open as possible. Long side splints with extension were applied.

Fifteen hundred units of antitetanic serum were administered and appropriate treatment for shock instituted.

The pulse and temperature gradually rose, so that twelve hours after the injury the pulse was 88 and the temperature 100.6; twenty-four hours after the injury pulse 98, temperature 102.8; forty-eight hours after pulse 120, temperature 101.8; during this time the patient had suffered from frequent emesis.

Forty-eight hours after the injury the interne upon changing the dressing found emphysema in the tissues adjacent to the wound, with a strong odor of decaying flesh. Nine hours later, or fifty-seven hours after the injury, I performed an amputation at the hip-joint by Wyeth's method. By this time the emphysema had extended so high that part of the incision had to be made through emphysematous tissue. The patient lost but little blood. The wound was left wide open and packed with gauze wet with seventy per cent alcohol. There was no appreciable shock, but 500 cc. of normal salt solution was given hypodermically while the patient was on the operating table.

As soon after the operation as the necessary preparation could be made the subcutaneous tissues adjacent to the operative field were injected with a supersaturated solution of salicylic acid in warm alcohol, as recommended by Dr. L. L. McArthur.

Just prior to the operation the pulse was 140 and the temperature 101.6.

For a time following the amputation the patient's general condition improved, the pulse and temperature gradually falling until nineteen hours later the pulse was 108 and the temperature 98.6. The emphysema gradually spread on to the trunk.

Suddenly, however, there was a change for the worse, the pulse becoming rapid and weak accompanied by delirium. The patient died twenty-seven hours after the amputation, eighty-four hours after the receipt of his injury.

Case 2. Male, aged 51, Chinese. This case was in the service of Dr. John E. Owens.

On December 19, 1909, at 4:30 P. M., the patient was admitted into the hospital with a gunshot wound through the calf of the right leg. The bullet passed through the muscles from before backward without striking either of the bones. The wounds, two small round openings, were cleaned and a sterile dressing applied.

His temperature on admittance was 99.2, pulse 88, and respiration 22. The pulse, temperature, and respiration remained about the same until noon the next day.

On the morning (December 20th) the skin

around the wound was discolored and gave out a thin, foul-smelling, bloody discharge. The patient's general condition seemed good. He smoked and talked with his friends.

About noon that day (December 20th) his pulse and temperature began to rise reaching 101.4 and 88 at midnight.

On the morning of the 21st his temperature was 100, and pulse 96. He suffered considerable pain but was conscious and his general condition seemed good. The leg by this time was discolored to about three inches above the knee, swollen, and emphysematous. There was a very foul odor of decaying flesh and some discharge from the wound.

He was given an anæsthetic at 3:00 P. M., and the leg widely opened by longitudinal incisions, alcohol dressings applied, and a strong solution of salicylic acid injected above the line of emphysema.

The temperature, pulse, and respiration were at 5:00 P. M., 101.8, 132, and 32. The temperature, pulse, and respiration gradually rose from that time, until at 9:00 P. M. the temperature was 102.8. This is the last temperature recorded. The pulse was 160 and respiration 44 at 12 midnight.

He had profuse emesis and became delirious at about 9:00 that evening, it being necessary to put him in restraint. He died at 12:40 A. M.

For the bacteriological findings that follow I am indebted to Dr. Guy of the resident staff of St. Luke's Hospital, which is as follows:

Cover glass preparation made from the sanious discharge contain a large bacillus, retaining the stain by Gram's method, capsulated, and sometimes showing a somewhat granular appearance. The bacillus is arranged in pairs, singly and sometimes in short chains. The free ends of the bacillus are round, but where two or more are joined the ends are square. Hanging drop shows a non-motile bacillus.

Culturally it is a facultative anærobe.

In milk which is the most characteristic, coagulation takes place rapidly, gas is very abundantly formed, the curd being riddled by the fermentation. The whey is clear and gas bubbles are seen clinging to the ragged curd. Litmus is turned red at first, but is soon decolorized.

Agar stout tubes show small colonies varying from pin point to pin head, white insert raised above the surface, and having regular edges. There is gas found in the bottom of the tube.

In blood agar growth is luxurious, hæmoglobin taking place and abundant gas formation.

Blood agar plates show small colonies, round white, pin head in size, surrounded by a hæmolytic zone. Dark colonies are usually marked by a bubble of gas. In old blood cultures there is a putrefactive odor.

Cultures were injected intravenously into a small kitten which was killed soon after and placed in an incubator. In twelve hours the cat was swelled to twice normal size by an inflammable gas.

The liver and spleen were foamy and showed on staining enormous numbers of the bacillus. Cover glass preparations showed a bacillus corresponding exactly to the one found in the bloody exudates.

Culturally it gave the same reaction.

The cultural characteristic and morphology of the organism found in case No. 2 correspond exactly to case No. 1.

DISCUSSION

DR. DANIEL N. EISENDRATH: I was very much interested in the first case reported by Dr. Plummer for the reason I think we are just beginning to appreciate the relative frequency of congenital anomalies of the kidney. Amongst the congenital anomalies of the kidney I include three — the variety shown by Dr. Plummer, which is the congenital displacement of the kidney, and the one congenital hypoplasia, and congenital malformation or anomalies in the blood-vessels of the kidney.

During the past winter my assistant, Dr. Strauss, and myself have been dissecting many cadavers, and it is remarkable with what frequency one finds these anomalies of the kidneys. So far, in about thirty cadavers, we have found one typical case of the so-called hypoplasia, a specimen of which I intended to have brought here this evening, in which one kidney is of the size of a small marble and the other kidney is comparatively normal in size. I have encountered such a case and reported it about three years ago in the Annals of Surgery, which caused a blocking up of the healthy kidney, producing complete anuria. The other kidney, the hypoplastic kidney, was not able to do any work thrown upon it through the blocking of the healthy kidney.

In regard to the condition which has been described by Dr. Plummer of dystocia, I recently have seen two cases of this kind. One of them was operated on by Dr. Kammerer in the German Hospital, New York. The patient complained of pain located over the sacrum, located between the umbilicus and symphysis pubis, and in the right side of the abdomen a distinct tumor could be palpated. I happened to be present when the abdomen was opened, and it was found the tumor with the kidney lay retroperitoneally over the sacral

promontory. The kidney was not removed in that case.

The second case was one in which the dystocic kidney caused a very serious obstruction to labor. I saw in the Hamburg General Hospital on the autopsy table an unusual kidney which had become wedged in between the uterus and the promontory of the sacrum and had caused dystocia.

As regards the anomalies of the kidney to which Dr. Plummer has called our attention in these specimens from Dr. Le Count's Museum in Rush Medical College, it is considerable of a surprise when you come to examine a number of cadavers to find the frequency with which these anomalies occur. Seldowitsch, who has examined one hundred and ten cadavers found that these anomalies of the arteries occurred in about thirty per cent of the cadavers. In our statistics so far we have only examined about thirty cadavers and found anomalies in fully fifty per cent. Of course, we cannot draw any definite conclusion from such a small number, but I do not think we, as surgeons, in general, give enough attention or attach importance enough to the value of these anomalies. We find, for instance, that this variety which Dr. Plummer has shown in these specimens is one of the most frequent ones in which there are two separate arteries arising from the aorta and running to the hilus of the kidney. These two arteries may rise from the aorta close together, or they may be two or three inches apart. Then there is another anomaly that is of the utmost importance, and that is, in which there are two separate arteries. This specimen shows two separate arteries given off from the aorta running to the upper pole and to the hilus, the one running to the upper pole being larger than the one running to the hilus. One of our specimens shows an artery running to the lower pole about the size of a goose quill, running from the iliac after leaving the aorta.

I think the case which Dr. Plummer has reported is exceedingly interesting and important.

Dr. L. L. McArthur: I have recently had come to me again a case which I referred to this society in connection with misplaced kidneys. It was the case of a young girl, nineteen years of age, with a tumor opposite the promontory of the sacrum that was tender, painful, which gave no shadow with the X-ray, although it gave many of the characteristics of a tumor of the bony pelvic wall, and which on exploration proved to be a horseshoe kidney with its arterial supply from the common iliac vessel. Being a horseshoe kidney and double, it was impossible of removal. Not having had permission from the girl to interfere with possible future pregnancies, I was obliged to close the abdomen. When she recovered, the parents and the girl were informed of the danger of letting this condition remain because each segment of the horseshoe reaching well down into the pelvis might be compressed by the uterus.

Two months ago she came to my office six or seven months advanced in pregnancy, and again refused to have any interference with the pregnancy. I do not know what the ultimate outcome will be in her case, but I think she is in great jeopardy. I communicated with her family physician and acquainted him with her condition.

I am particularly interested in the emphysema produced by the organism Dr. Plummer has described, because I had three successful cases by the simple injection of multiple doses of salicylic acid, a drop at a time, in the periphery of the advancing disease, checking the disease, and the gangrene becoming localized. The soft tissues sloughed off only so far as the wall of salicylic acid which was put as a barrier between the advancing organisms. After operating on a case of carcinoma of the pancreas involving the common duct and producing icterus, making an anastomosis between the gall-bladder and the duodenum, I was unfortunate enough to have a case of acute invasion of the liver by the bacillus capsulatus ærogenes, the infection seeming to have spread from the contents of the intestine or bile tract to the liver, because there was no evidence at any time of peritonitis, and a post-mortem examination showed union between the gall-bladder and duodenum to be all right and to have remained perfect. The liver on section after death presented the appearance of a sponge. On section it resembled more lung tissue than liver tissue.

Dr. H. M. Richter: About two years ago a patient was brought into the Wesley Hospital with a compound fracture of the lower part of the leg, and he was treated in the usual manner with ordinary scrubbing and external antisepsis. We did not use any iodin or carbolic acid or any of those agents. One morning at nine o'clock it was noticed that a gangrenous area had formed around the open wound and emphysema showed itself over quite an area. The patient refused operation at that time and it was eight hours later before consent of the patient was obtained to amputate. At that time the gangrene had reached two or three inches above the knee-joint and the emphysema had extended up the thigh and onto the buttocks, and up into the abdomen. If a thigh amputation is called for with the idea of getting rid of infection, it seems to me in such a case a thigh amputation would be contraindicated, because, of course, it would be quite impossible to get above

the area of infection. I made a high amputation and in order to relieve tension in the tissues above the line of amputation I made longitudinal slits well up into the buttocks and level of the pelvis in front, the slits extending through the skin and fascia with the idea of relieving tension and for no other purpose. This patient, like the case reported by Dr. Plummer, showed no evidence of intense sepsis. That is to say, these patients do not die from the infective process, but from mechanical complications. The outcome in this case tended to prove definitely, and as a matter of experimental evidence would prove it, that with the infection extending above the line of incision the patient is safe if pressure is relieved. This patient recovered.

DR. ARTHUR DEAN BEVAN: With reference to the first case, I desire to state that I have recently had the opportunity of operating upon a somewhat similar case of misplaced kidney such as Dr. Plummer has presented to you. It was rather interesting. The man was operated on by a well qualified surgeon four or five years before for a tumor almost in the median line, or a little to the right of the median line just below the umbilicus. This tumor was painful; it could be outlined and felt and it had caused severe attacks of pain, which lasted for hours or some days. The surgeon, a well-known operator, made a midline incision, and came down upon a retroperitoneal mass which he thought was probably the kidney, or a horseshoe kidney. The operation was exploratory. He closed the wound and the patient went on to recovery from the operation, but the old trouble remained. About six months ago he came to Dr. Billings, who had the urine examined carefully and found pus and blood in it. An X-ray examination disclosed a stone in front of the promontory of the sacrum. We then had the ureters catheterized; the catheter that went into the right ureter made a short curve about three inches long, while the one in the left ureter went into the entire length of the normal kidney pelvis. The X-ray is a beautiful example of work of this kind. An X-ray was taken with the catheter *in situ*. It proved definitely the presence of stone in the misplaced right kidney. The question was how to remove it, whether a midline incision should be made, and whether the transperitoneal or retroperitoneal route should be adopted. As a matter of fact we decided upon the retroperitoneal route, and it was simplicity itself. A muscle-splitting incision, such as weu se for an appendix operation, was made, and then enlarged by stretching and with no difficulty at all one could reach, after stripping back the peritoneum and not going into the peritoneal cavity, the pelvis of the kidney. Pyelotomy was made and the stone removed from the pelvis and ureter. Drainage was simple. A cigarette drain was inserted down to the point, no attempt was made to close the opening in the pelvis, because of the considerable depth of the wound and the difficulty of such a procedure. The patient went on to an uninterrupted recovery. The kidney was not remqved because it seemed to contain a great deal of normal kidney tissue.

I want to say a word or two in regard to gas bacillus infection. We had, some time ago, a case of gas bacillus infection in our service; a boy had his arm caught and wrapped around a rather small machinery shaft. Every time the arm would go around the shaft it would break the bones every two or three inches so that there were multiple fractures from the wrist to the shoulder. We made an effort to save the arm. The radial artery was intact and the radial pulse could be felt; the ulnar pulse could be felt. On that account we scrubbed up the arm and attempted to save it. There was very little injury to the skin. At the end of the second day gas bacillus infection occurred and spread rapidly up the arm, so that a shoulder-joint amputation was made above the point of emphysema, and the patient went on to recovery without any complications.

DR. PLUMMER (closing the discussion): The fact of interference with parturition by a misplaced kidney was mentioned. In the small specimen where the kidney lay in the small pelvis, apparently, such a difficulty might have been met with if pregnancy occurred. I do not know whether that kidney came from a man or a woman, but in the female pelvis it might have interfered with delivery.

There is a recent article by Dr. Oscar Meyer, published in 1908 in the Beiträge zur Pathologischen Anatomie und zur Allgemeinen Pathologie, Ziegler, vol. 44, page 1, in which he gives a detailed description of a dozen or more of these cases of malposition of the kidney, and also of horseshoe kidney, and the interesting question is brought up in regard to the anomalies of the renal vessels. The question is whether a kidney is misplaced because the vessels originate from an abnormal location, or do the vessels which originate from an abnormal location accommodate themselves to a kidney which was originally misplaced? One thing I noticed in my specimen, as in all Meyer's diagrams, the adrenals stay in the normal position. No matter how far from the normal position the kidney may be the adrenals you will find where they belong.

DR. ALEXANDER HUGH FERGUSON read a paper entitled, "Carcinoma of the Pancreas." (See p. 393.)

DISCUSSION

DR. ARTHUR DEAN BEVAN: I am sure that all of us have been very much interested in the subject of pancreatic lesions in the last few years. There is no doubt they are very much more common than we formerly believed. There is one point that has seemed to me of great importance in this connection, namely, the differential diagnosis between malignant disease and chronic interstitial pancreatitis. I was in hopes that Dr. Ferguson would possibly offer some suggestion along this line. I have seen and operated on about a dozen cases of carcinoma of the pancreas, and about the same number of cases of chronic interstitial pancreatitis. I have never been able to obtain clinical evidence which would enable me to make a differential diagnosis between the two affections. I remember one winter when I was on the service of the Presbyterian Hospital we had six cases of supposed carcinoma of the pancreas, and our attention was thu specially called to the subject. I made exploratory operations on these patients. In two of the cases where we found a large hard mass in the pancreas, and I gave the opinion that it was carcinoma, I gave a hopeless prognosis. One case I drained externally, and in the other case we did a cholecystenterostomy. Both of these patients went home and proceeded to recover entirely and to discredit my diagnosis, and they were evidently cases of chronic interstitial pancreatitis.

Yesterday I operated on an old lady with a long history of gall-stone disease. The gall-bladder was impacted with stones and a hard, firm mass could be felt in the pancreas. I could not say whether it is carcinoma or chronic pancreatitis. Now to my mind this is one of the most important points that confront us as surgeons to-day, namely, how to make the differentiation between the two diseases. I am free to confess that I have no knowledge which will enable me to say in a case of that kind whether I have to deal with carcinoma of the pancreas, or with chronic interstititial pancreatitis. It is dangerous to remove a section of the pancreatic mass for histologic examination on account of the dangers of necrosis and hæmorrhage. I am rather of the opinion that we should give all these cases of hard swellings in the pancreas the benefit of the doubt and institute wherever possible drainage, and of late I have been much in favor of cholecystenterostomy rather than cholecystostomy. If the patient's condition is fairly good I should prefer cholecystenterostomy, because the patients are much more comfortable after cholecystenterostomy than after cholecystostomy. I now make the operation with suture. We are all in the position to-day where we long for some blood test or some other form of easily employed means of diagnosis to make this differentiation between carcinoma and chronic inflammatory processes not only of the pancreas but in many other locations.

DR. MAURICE I. ROSENTHAL, Fort Wayne, Indiana: I have quite recently had some experience in the treatment of these cases of malignant disease of the pancreas and have met with difficulties along the lines laid down by your president, Dr. Bevan. The early diagnosis of cancer of the pancreas is not easy, notwithstanding the more recent laboratory investigations, so that at the present time cancer of the pancreas resolves itself into a differentiation between that disease and disease of other neighboring organs, or inflammatory disease of the pancreas itself. I have one old lady whom I see occasionally, and upon whom I operated some ten years ago or more, and in this case I made an unfavorable prognosis, mistaking inflammatory for malignant disease. This old lady, whenever she sees me says, "Doctor, I am still alive."

We were dealing with an inflammatory tumor of the head of the pancreas, which, because of its hardness, its evident infiltrating character, its nodular feel and contour, and because of its having evidently produced metastatic involvement of neighboring glandular structures, we felt justified after opening the abdomen, in making an unfavorable prognosis. After opening the abdomen we found an atrophic gall-bladder and drained it for the purpose of relieving the cholemia. The patient permanently recovered. Since then I have removed and examined metastatic glands in cases in which I have suspected malignant disease of the pancreas, and these apparently carcinomatous glands have frequently proven to be inflammatory in character. When we open the abdomen in these cases we find such difficulties as Dr. Bevan has stated.

A second case which possibly illustrates some diagnostic features of this disease is one which I remember very well, referred by Dr. Cook of Bluffton. This woman was brought in with some jaundice. There was no history of biliary colic, but there was evident a palpable distended gall-bladder. The gall-bladder was in its proper position, just where you would expect it, under the liver. Pressure on the gall-bladder elicited no pain whatsoever. We immediately suspected and stated that there was a malignant condition of the gall-bladder, and that this was not a case of gall-stones.

This (the gall-bladder) is one of the places where malignancy is not painful on pressure. This is

frequently true of malignancy in the head of the pancreas itself. This case proved to be one of malignant disease of the head of the pancreas, and between the head of the pancreas and the liver there lay a collapsed and compressed gall-bladder.

One woman, who left the hospital day before yesterday, was brought in with extreme jaundice, with a very large liver, and under this liver, presenting below the umbilicus was a distinctly palpable gall-bladder. This gall-bladder was not painful on pressure, and here again, on this account we suspected malignancy. We could feel no tumor of the pancreas, but on opening the abdomen the pancreas was found enlarged and evidently malignant. There was a hard, nodular mass infiltrating the neighboring organs, and I do not doubt that this case is one of malignant tumor of the pancreas. We made a cholecystenterostomy at the upper end of the ascending colon, because here I think we have an area of lesser bacterial activity. This woman left the hospital a few days ago. Her cholemia is disappearing. For the reason that this tumor produced no pain on pressure, knowing that the cholemia came on gradually, and that we had a distended gall-bladder, in the absence of stone I felt secure in the diagnosis that we had a malignant tumor to deal with.

This subject is becoming more and more interesting to us in a surgical way, but we can hope for very little, so long as the early diagnosis of malignant growth in the pancreas remains an impossibility.

Dr. Ferguson (closing the discussion): The only new thing that has been brought forward in the way of differential diagnosis is the work of Cammidge, who maintains that in inflammation of the pancreas there are certain crystals, while in carcinoma there are no crystals. Of course, we can bring out the various symptoms and signs of disease of the pancreas, but I think this special case is interesting, both from a clinical and pathological standpoint, as showing an exception to Courvoisier's law.

Dr. L. L. McArthur read a paper entitled, "A Communication Regarding a Modification of the Technique in Suprapubic Prostatectomy." (See p. 412.)

CHICAGO GYNECOLOGICAL SOCIETY

Regular Meeting Held January 21, 1910, with the President, Dr. Charles B. Reed, in the Chair

HERBERT MARION STOWE, M. D., Editor

I. CASE OF INCOMPLETE UTERINE RUPTURE FOLLOWING KRISTELLER EXPRESSIONS DURING DELIVERY; RECOVERY. II. CASE OF UTERINE RUPTURE AT TERM PRODUCED BY THE KARL BRAUN CRANIOCLAST; PROLAPSE OF INTESTINE INTO UTERUS; EXPECTANT TREATMENT; RECOVERY. III. CASE OF PNEUMOCOCCIC INFECTION IN THE PUERPERIUM, PLEURITIS, LOBULAR PNEUMONIA, AND PERICARDITIS; PULMONARY ABSCESS; RECOVERY

By HERBERT MARION STOWE, M. D.

Case 1. Mrs. S., age 30, para 3. Family and personal history negative. The first labor in January, 1907, was normal and recovery was complete. In April, 1908, she miscarried at three months. The following day, a physician curetted the uterus to remove some retained decidua. During the operation, the uterus was perforated in the left wall. Following this accident, the patient suffered from fever, vomiting, chills, and pain in the abdomen for nearly two weeks, and she gave a typical history of pelvic peritonitis. On July 16, 1909, her second labor began and she called a midwife to attend her. The first stage was normal but the uterine contractions became weak and progress was slow when the head had descended to the pelvic outlet. The head was

visible for a period of over two hours. The midwife now attempted Kristeller expressions to assist delivery and later explained that she applied the thumbs over the fundus and the fingers along the sides of the uterus and pressed in the direction of the inlet. Most of the pressure was applied laterally. During the third attempt, the woman suddenly cried out with pain and the pulse became rapid and weak. No further expressions were made.

Upon my arrival, one hour later, the patient appeared somewhat shocked. Pulse 120 and weak. The abdomen was tender to pressure and the patient complained of sharp pain on pressure over the left iliac fossa. No emphysema was present but an ill defined resistance was made out at this point. No heart tones were audible. The pelvic measurements were normal and the perineum was relaxed from an old laceration. The fœtal head was flexed and the occiput lay anterior. I delivered the fœtus easily with forceps, using not over ten pounds of traction. It was dead and weighed seven pounds and four ounces. An examination of the uterine cavity disclosed a laceration in the left wall, eight centimeters in length, beginning just above the vaginal fornix and extending upward and slightly posterior. The rupture was incomplete and was completely closed in by the tissues of the broad ligament. The rent was filled with a blood clot.

This tear was packed with lysol gauze and the uterovaginal tract firmly tamponed. Externally, the portion of gauze packed in the broad ligament was clearly palpable. This tampon was removed on the next day. The patient soon recovered from her shock and the pulse became normal on the fourth day. She was given ergot and hydrastis, placed in Fowler's position, and the lower abdomen was covered with ice bags. She left her bed in three weeks and since has recovered perfectly.

It is possible that the pressure exerted by the midwife over the left uterine wall was the direct cause of the rupture, but undoubtedly the previous injury constituted the primary factor. According to Gans and Eisenstein, previous uterine perforation is a significant factor in the etiology of many cases of spontaneous or hysterogenetic rupture at full term. Previous curettements with a sharp curette or gynecological operations on the uterine body constitute important data in the obstetric history of every pregnant woman.

Kristeller expressions are generally considered to be devoid of danger. When properly performed, they are of great assistance in labor. Care should be taken, however, to avoid pressure on the adnexa. Several cases have been reported where ovarian and tubal abscesses have been ruptured by this lateral compression. Lieber reported in 1909 a similar case of uterine rupture due to a midwife assisting delivery with technically incorrect Kristeller expressions. The woman went into immediate collapse and the fœtus passed into the peritoneal cavity. The abdomen was opened but death occurred on the operating table. No previous history of uterine injury was obtained.

CASE 2. Mrs. G., age 27, para 1. Polish housewife. The patient had been in labor for fifteen hours and several attempts had been made to deliver her at home but to no avail. She was sent to the Cook County Hospital on June 16, 1909. The patient was well nourished but anæmic. Her pulse was 126 and weak. Temperature 100.8° F. She had the appearance of one who had just passed through an operation. The pelvic measurements were IS, 21; IC, 23; BiT, 29; Baud, 18; CD, 11.5 and CV, 9 cm. The pelvis was of the flat generally contracted, non-funnel shaped variety. The fœtus presented by the head in the occipito-læva-transverse position. It lay above the inlet and was movable. The funis had prolapsed and was pulseless. No threatened rupture of the uterus was determined. Craniotomy was the operation of election. The head was perforated and the Karl Braun cranioclast applied to it by the interne. The external blade was passed somewhat posteriorly. The blades failed to lock and as they were withdrawn, a coil of intestine was palpable within the cervix.

Upon examination, a circular rupture was discovered about ten centimeters above the external os uteri in the posterior wall. It was possible to pass three fingers through the opening. The bowel had not been separated from its mesentery as far as one could determine by palpation. At this time the mother's pulse became almost imperceptible and the cyanosis was so marked that the anæsthetic — ether — was withdrawn. The poor condition of the patient, the shock, cyanosis, pulse (160) and the probability of infection in the previous operations indicated the expectant line of treatment. It was deemed safer to trust to the danger of intrapelvic delivery and sepsis from the prolapsed intestine than to resort to laparotomy and probably the Porro operation.

The intestine was, therefore, replaced and a second attempt made to apply the Braun cranioclast but it failed to hold. The cranial vault had been so injured by the previous operations that it was impossible to secure a firm hold. If the three-bladed cranioclast of Auvard had been accessible, I believe that I could have finished the delivery.

Notwithstanding the danger of version after craniotomy, the patient's condition demanded an immediate delivery and podalic version and extraction offered the quickest method. Several loosened fragments of bone were removed and a foot brought down with moderate difficulty. The after coming head was crushed and easily extracted. The child weighed seven pounds. The placenta was removed at once, and the bowel found to be slightly prolapsed through the rent. No further injury to the uterine wall was discovered. The bowel was replaced and the rent and uterovaginal tract tamponed with iodoform gauze.

The woman was placed in Fowler's position, given small doses of ergot and hydrastis and ice bags applied to the abdomen. The bowels moved spontaneously on the second day and the stools contained blood clots. The passages were bloody for several days. The patient complained of severe cramps in the limbs and pain in the lower abdomen. The hypogastrium was painful to deep pressure. Nausea was present on several occasions but no vomiting occurred. Moderate tympany. These signs were undoubtedly due to a localized plastic peritonitis. The pulse and temperature gradually fell and became normal on the tenth day. The uterus was packed three times for a period of two days each.

Mrs. G. left the hospital on the thirteenth day of the puerperium against medical advice. I saw her in November, 1909, and found the uterus in the first degree of retroversion. The uterus was movable but was moderately painful on pressure. Otherwise, her recovery was satisfactory.

CASE 3. Mrs. L., age 41, Russian Jewess. Both family and personal history are negative. She is the mother of twelve children. The labors were normal. No history of puerperal infection. She was taken in labor with her thirteenth child on August 6, 1908, and was under the care of the Outdoor Department of the Chicago Lying-In Hospital. The first stage was tedious and lasted nearly twenty hours. At this time she entered the service of Wesley Hospital. The patient was a strong and muscular woman in good condition. Pulse 90, temperature 99°F. The abdomen was pendulous and the diastasis between the recti was marked. The fœtal head lay in a position of right deep transverse arrest. During the second stage the fœtal heart tones became rapid and irregular and the child was delivered with forceps. There were no lacerations of the soft parts. The child was slightly asphyxiated but was easily revived. The patient was carried back to bed in good condition. A slight cough had been present for a week but no bronchitis.

Several days following delivery the patient complained of a sharp pain in the left thigh and leg suggestive of a phlegmasia alba dolens but no thrombosed veins could be palpated at any time nor was there any sign of lymphangitis. The involution of the uterus was normal and the fundus sank below the plane of the inlet on the ninth day of the puerperium. The breasts and nipples were negative. There was no evidence of inflammation or infection in the abdomen or pelvis at any time. The generative organs appeared to be normal in every way.

On August 11th, the patient began to perspire freely. A sharp pleuritic pain developed in the right chest. Upon finding evidence of fluid, three ounces were withdrawn by an aspirator but the laboratory findings were negative. On the following day lobular pneumonia was diagnosed by Drs. A. Davis and C. A. Elliott, who kindly examined the patient. From August 12th to the 17th, the temperature rose gradually and the pulse respirations increased in frequency. At eight o'clock in the evening, the patient suddenly collapsed, became markedly cyanotic, and was extremely prostrated. The dypsnœa was extreme. It was necessary to prop up the woman in bed and administer oxygen. The respirations quickly rose from 30 to 50 a minute. The temperature dropped to 96° (rectal) and then rose to 103.6°F. The pulse rose from 100 to 140 and became very irregular. A pericardial friction sound was heard over the rightside of the heart, being synchronous with the cardiac action. Under energetic stimulation, the condition improved materially. The following day the pericardial friction sounds became less audible and soon disappeared. The pulse was still irregular and weak. The diagnosis was confirmed by Dr. N. S. Davis. The cough now increased in frequency and expectoration became more profuse. An area of dullness gradually developed near the junction of the upper and lower lobes of the left lung posteriorly and on September 4th an abscess ruptured into the bronchi and a large amount of pus was expectorated. Following the rupture of the abscess, the dullness disappeared. The condition improved and the patient left the hospital on September 13th. One month later she claimed to be perfectly well.

The urinary findings were negative except for a trace of albumen. A culture of the blood was negative. Pneumococci were found in both the cervical secretion and the sputum.

The treatment consisted in the administration of strychnine and digalen for the heart, ice bags for the pericarditis, and later ammonia carbonate to promote the expectoration.

DISCUSSION

DR. GEORGE SCHMAUCH: These cases are very interesting. In regard to the first case, it looks to me very improbable that perforation of the uterus by the curette could have occurred so low down in the uterus. Generally, such perforations occur high up in the fundus. I am a great friend of the Kristeller method of expression, and I have never seen any bad consequences from it, although such cases have been reported.

In regard to the second case, I would like to say that the Braun's cranioclast never should be applied over the occiput. It will not hold. The outer branch always should be placed over the face. It is the only way to take hold. If you place the cranioclast over the occiput, you either tear out the occiput or the cranioclast will come away.

The Kristeller method of expression was devised to replace the pressure of the abdominal wall, so that the only time to use it is during the last stage of labor, when the head is on the pelvic floor. Every obstetrician who uses scopolamin is forced to use this method, especially in primipara. You cannot make them help you when under the influence of scopolamin, because you cannot rouse the woman sufficiently to use her abdominal muscles as she should. As long as the head is above the pelvis, we use Mueller's method, because the Kristeller method is not to be used until the head is down on the pelvic floor.

DR. G. KOLISCHER: It is true that the curette usually perforates the uterus high up, but as a rule the perforation is started by the instrument that is used for the dilation of the cervix, so that the hole is low down into the broad ligament.

As to the application of the expression method. Often we find that the uterus is squeezed to express its contents, but the object of the Kristeller method is to try and force the head out of the outlet by using the breech of the patient as a lever. We do not squeeze the uterus, but press the fœtus down. Thus, the uterus can neither be lacerated nor torn.

DR. J. CLARENCE WEBSTER read a paper entitled "Mistakes in Diagnosis Relative to the Urinary Tract in Females." (See p. 399.)

DISCUSSION

DR. T. J. WATKINS: Dr. Webster's bladder cases remind me of a case recently under my observation. The chief symptom was a burning pain in the region of the bladder. The patient's physician considered her neurasthenic. On examination I found a small cystocele and a somewhat relaxed perineum. I was inclined to regard the patient as being neurotic, and the burning sensation as imaginary. The urine contained a few white cells, but was otherwise negative. Cystoscopic examination disclosed a number of small capillary hæmorrhages in the mucous membrane of the bladder. The residual urine was rather large in amount and the patient was in the habit of straining and had a constant desire to urinate. Undoubtedly, this straining produced the capillary hæmorrhages which in turn caused the burning sensation. The cystocele was repaired, the perineum was strengthened, the bladder was irrigated two or three times, and at the last cystoscopic examination the hæmorrhagic spots had almost entirely disappeared.

One cannot take exception to much, if anything, Dr. Webster said. I disagree with him in one respect, however, and that is that bladder symptoms are often due to traction and pressure on the bladder. One frequently sees cases where it is claimed that the bladder symptoms are caused by anteflexion of the uterus. As a student of Emmet, I saw many cases of bladder pain caused by pulling of the uterosacral ligament on the bladder. Then we would see cases of large tumors where there was apparently no space for the bladder, and yet there were no bladder symptoms. In cases of procidentia, where most of the bladder is outside of the body, there frequently are no bladder symptoms. All of which makes one believe that pressure and traction on the bladder are not often a cause of bladder symptoms. I have studied this question for many years, and it seems to me that practically all of these cases are cases of chronic infection of the bladder, usually gonorrhœal.

The point of palpating the lower end of the ureters to determine the presence of tenderness and comparing one side with the other is of extreme importance. If the tenderness is greater on one side than on the other, then one should be almost certain of ureter trouble.

I have seen cases of hysterical retention of urine. I would have them go to a hospital, instruct the nurses and internes to say nothing to them about their retention of urine, and even refuse to catheterize. There is not much danger of rupture of the bladder, because the patient will empty it when it is full. Not long ago a patient went to the hospital who had been catheterized for two or three months. The internes and nurses were instructed to pay no attention to the bladder. At the end of a week she went home cured. Her bladder at no time was admitted as a topic for conversation.

As to stomach symptoms and prolapse of the kidney. I recall the case of a woman who had much stomach disturbance. Stomach analysis was negative. One day the interne told me that she had

a prolapsed left kidney. I examined the patient in various positions, but failed to find the prolapsed kidney. Two or three days afterward the interne told me that he had found it again; still I could not find it. One day when she had much pain I examined her and found a prolapsed left kidney. The lower pole was some distance below the line of the anterior superior spine of the ilium. The kidney was stitched up and the stomach symptoms disappeared. I am sure that the reason I could not find the kidney at first was that the woman held the abdominal muscles so rigid as to hold the kidney in place. I might have found it if I had had her anæsthetized.

The long right lobe of the liver was an interesting point, and it suggests the value of a careful examination of all these cases of enlargement in the region of the gall-bladder and kidney by auscultatory percussion. I believe that one can by that means always differentiate between enlarged liver and tumor of the kidney. I saw a case with Dr. Danforth, in which auscultatory percussion disclosed a long right lobe of the liver, the diagnosis being confirmed by exploratory incision.

There are two or three points that I bear in mind in the diagnosis of a prolapsed kidney. One is to inquire on which side the patient lies. With a right prolapsed kidney the patient always invariably sleeps on the right side; the contrary is true when the left kidney is prolapsed. Then determine whether the pain is relieved by lying down, as is the case in a prolapsed kidney. Then, the pain is always described as a pulling sensation underneath the ribs. Not many diseases produce that kind of a pain.

DR. GUSTAV KOLISCHER: The majority of physicians insist on treating every woman who complains of disturbance in or near her urinary organs by bladder irrigation, without making an examination. No treatment of cystitis should be begun or continued without cystoscopic examination. The complaint of pain in the bladder should always arouse a suspicion of kidney disease. Often, frequency of urination may be the first symptom of tuberculosis of the kidney, and thus we might miss the best time for operating if we proceed to irrigate the bladder without making a diagnosis. One can almost say positively that there is no condition of the kidney that cannot be diagnosed by cystoscopic examination. There are always changes around the ureteral opening, a gaping or pouting, or rigidity of the ureteral end. Then it remains to determine the particular kind of kidney trouble.

As to disturbance of the bladder by dislocation of the bladder by tumors, adhesions, and other conditions, I believe that anteflexion of the uterus never produces bladder symptoms, but whether other dislocations will produce symptoms or not, depends on one point, namely, that the female bladder is very adjustable. There may be bladder disturbance in rapidly growing tumors of the uterus or in any condition which develops rapidly, even when the bladder wall is not involved in the inflammatory process.

As to diagnosis of floating kidney, two points should be considered. When the patient resists a thorough examination by contraction of the abdominal walls, it is a good plan to examine the patient in a warm bath. It is astonishing how easily you can examine all the abdominal organs. Next, pass into the ureter of the affected side a sound that will show in an X-ray picture. If the kidney pushes downward, you will find all kinds of curves in the ureter, as shown by the sound. Palpation of the ureters at the lower end is a very important procedure, and Saenger first pointed out how easy it is to do this if you know where to look for the ureters. It is astonishing how often the ureters are mistaken for the round ligaments. The difference in tenderness between the two sides, as pointed out by Dr. Watkins, is also of importance.

DR. W. M. THOMPSON: The term cystitis is used so generally that the average practitioner is apt to be led astray in his diagnosis. I am reminded of two cases I saw this winter. The first patient had frequent micturition, with some pus in the urine. The cystoscope revealed a slight inflammation at the base of the bladder. I tried all means of treatment and finally drained the bladder through the vagina. That gave the patient relief for a time until the fistula closed, when the symptoms returned. There was no prolapse of the bladder; the patient was healthy and vigorous, so that for a time I was inclined to regard the case as one of neurosis. Finally, I examined the abdomen carefully and found that the uterus was not as freely movable as it should be. I operated and found extensive adhesions in both broad ligaments and between the uterus and bladder. When the bladder was emptied, the uterus was slightly movable. I cleaned out the pelvis and the woman is now entirely well.

The second patient had cystitis with slight inflammation in the base of the bladder, a slight prolapse, and a relaxed perineum. She suffered much from constipation and gas in the intestines. I catheterized the ureters and kidneys. The urine was clear, although occasionally there was a little pus. She went to Denver and then to Pittsburg. She saw several good men in both places, but failed

to get any relief. She finally returned to me. On looking over my notes on her case, I found recorded a small cystic ovary on the right side and prolapse of the transverse colon. I performed a laparotomy and found many adhesions between the omentum and bladder; the transverse colon was drawn down, and there was ptosis of the stomach. There were some adhesions in the broad ligaments on both sides. There was no thickening of the tubes. I released the adhesions, removed both tubes and ovaries, and eight days afterwards she had a hæmorrhage into the broad ligament on the right side, probably due to absorption of the catgut. She coughed and sneezed and jumped up in bed and immediately complained of a severe pain in the side. On the following day a tumor was felt which I concluded was due to a hæmorrhage into the broad ligament. This tumor became infected. Her leucocytosis rose from nearly normal to 40,000 and the abdomen was opened again. As a result the adhesions may have returned and she may have bladder symptoms again. This case suggested to me how one might overlook abdominal conditions and regard the case as a neurosis, when really there was a sound pathologic basis for all of the symptoms. A slight inflammation at the base of the bladder is easily relieved by irrigation, but these patients have something more than that the matter with them, and they may suffer more than they would with a large tumor.

DR. WEBSTER (closing): I agree in the main with Dr. Watkins and Dr. Kolischer. We frequently find these conditions without any bladder symptomatology. The bladder adjusts itself to many conditions in a perfectly wonderful way, but when we find such bladder symptoms I cannot believe that they are always due to infection in the bladder. I remember a case I saw in Martin's clinic, in Berlin in 1888; a Russian lady doctor, one of my co-workers. One day she appeared as a patient on the operating table. Martin removed a small fibroid from the anterior wall of her uterus. Previously she had been treated for frequent and painful micturition. There was no cystitis, and there was nothing pathologic in the urine. Martin thought that the symptoms were caused by the pressure of a fibroid. The lady recovered entirely in four or five weeks.

I have seen other cases where the pressure of a small fibroid on the bladder caused frequent micturition and do not think that they are rare. They are not necessarily accompanied with bladder infection.

Dr. Kolischer rightly insisted on the importance of X-ray catheter work in some of these cases. I have had a number of skiagraphs made with the catheter in position. I use the metal silver-wire-wound catheter.

Diseases of the urinary tract provide us with many surprises. Why some cases of traction and pressure are associated with symptoms related to the bladder, while others are not, I do not know. But this is nothing more surprising than we find in cases of pelvic infection. Ordinarily, with a pyosalpinx we expect to find a fairly definite history, and yet, every now and then, we find a pyosalpinx, not tuberculous, without any previous characteristic symptomatology. Some of these patients have no pain. The ureters may sometimes be extensively diseased without definite symptoms. An interesting example is now under my care in the Presbyterian Hospital, a woman who had been under Dr. Billings' observation for several years. She has been in good health during the last two years until within the last few weeks, when she began to complain of backache and a bearing-down feeling. She looks healthy. I examined her and thought she had a double pyosalpinx. There was no particular tenderness, but there was a resistant elastic swelling on each side. There was a little pus in the urine; no tenderness over the ureters. I opened the abdomen and found the broad ligament on each side filled with an enormously enlarged ureter. On the right side it felt like a hydrosalpinx; on the left side it felt exactly like a pancreas.

TUBERCULOSIS OF THE PELVIC VISCERA

BY EFFIE LOBDELL, M. D.

The patient from whom this specimen was removed was eighteen years old, but had never menstruated. Two months before I saw her she was married and shortly after began to have pelvic pains and considerable discomfort. On examination, I discovered a mass projecting down into the vagina from the cervix. I excised a small piece for microscopic examination. It proved to be a tubercular lesion, and a week later I extirpated the uterus, tubes, ovaries, and upper portion of the

vagina, which was involved in the growth. The uterine cavity was entirely closed. There were many adhesions in the cul-de-sac, of the intestines to the uterus and tubes, with many granulations on the intestines and peritoneum.

DISCUSSION

DR. J. CLARENCE WEBSTER: The uterus seems to be of the infantile type. It is only about two inches long, and the cervix is longer than the body. How are the secondary sexual characters?

DR. LOBDELL: The woman was very well developed in every way.

DR. T. J. WATKINS: This specimen was especially interesting in that it would indicate that the tuberculosis was primary in the cervix. It is interesting to know that a tuberculosis of the genital organs is ever primary and not always secondary. The specimen is more suggestive of primary tuberculosis in the cervix than any case I have ever heard of.

DR. CHAS. B. REED: It is interesting to know whether the serum treatment might have been used, or whether radical removal was the only treatment. The serum has been used successfully in many localized conditions.

DR. GUSTAV KOLISCHER: The specimen illustrates another point, namely, that while the general surgeons have frequently recorded in the literature cases of tuberculosis of the vagina, the condition is not recognized by gynecologists. I recall only one published case, that of Friedlaender, from Olshausen's clinic, but even that might have been secondary. So far as the tuberculin treatment is concerned, especially for lesions involving only the cervix, it has been shown that, as in kidney tuberculosis, it is successful only in a very limited number of cases, and that when the tubes are involved, the treatment is without any effect. So that the radical operation is the proper thing to do, provided that there are no lesions of the lungs or elsewhere.

DR. GEORGE SCHMAUCH: The queer form of this growth is interesting, a sort of cauliflower growth, which makes the case a very rare one. The only form of tuberculosis similar to this is tuberculosis verrucosa of the skin.

DR. LOBDELL: I made a comparative study of this case with one of specific invasion seen a few months previously. It was a tumor of the cervix which subsided promptly under anti-specific treatment. I did not try the serum treatment or any other form of treatment in this case, mainly because the patient could not be controlled very well. It was almost impossible to keep her in the hospital after the original examination was made, because she was so very well. Therefore, it was deemed advisable to do something which in this particular case would do the surest good.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

FREDERIC A. BESLEY, M. D.

GEORGE E. BEILBY, M. D. — WM. R. CUBBINS, M. D. — AIMÉ PAUL HEINECK, M. D.

WM. C. DANFORTH, M. D. — FREDERICK G. DYAS, M. D. — G. T. COURTENAY, M. D.

FRED C. ZAPFFE, M. D. — JAMES F. CHURCHILL, M. D. — B. J. O'NEILL, M. D.

ARTHUR B. EUSTACE, M. D. — JOHN A. WOLFER, M. D. — H. A. POTTS, M. D.

The Nature of the Effect of Gastroenterostomy (Die Wirkungsweise der Gastroenterostomie). A. PERS. *Nord. Med. Arkiv.*, 1909, b. xlii (Kirurgi), h. 1 and 2, Nr. 2.

Pers tested on human beings the work done by Cannon and Blake and Leggett and Maury on dogs. His material consisted of forty cases which had previously undergone the operation for gastroenterostomy for benign conditions from one month to six years. Of these cases seventeen showed stenosis due to scar formation; seventeen spastic condition due to ulcer; two duodenal ulcer; one each ulcer of the lesser curvature, ulcer of the pylorus and bilocular stomach, and gastroptosis. After carefully examining normal individuals with bismuth solutions and the X-ray, Pers determined the normal. Using the same method with his cases he found that in thirty-eight food passed only through the gastroenterostomy opening, in one case a small part passed through the pylorus, and in one case the course could not be determined. Of the thirty-eight cases fifteen represented a type where the food passed into the pyloric portion of the stomach, remained some time and then passed through the gastroenterostomy opening; in fifteen the food passed into the pyloric portion, remained but a short time and then passed through the opening; while in eight cases the food passed directly through without going into the pyloric portion. Pers thinks, therefore, that he is justified in concluding that the food practically always leaves the stomach by the anastomatic opening.

C. G. GRULEE.

Pathology of Appendix Inflammation (Über das Segmentäre bei der Wurmfortsatzentzündung). WILHELM BRÜNN. *Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, vol. xxi, No. 1, p. 1.

The author is of the opinion that inflammation of the appendix is due primarily to some interference with the normal circulation in the blood-vessels of the mesentery of the appendix, and that it is a mixture of acute inflammation, hæmorrhagic infarction, and stasis. Whether or not this is due to a bacterial invasion, he is not prepared to say, but as the result of extensive clinical observation and experimental research he is led to say that if the mesenteric artery of the appendix is ligated for two or three hours and the ligature is then removed, acute inflammation and hæmorrhagic infarction will take place in the end arteries in the appendical mucosa. If the circulation is obstructed for a longer period, the pathologic process will extend deeper into the wall of the appendix, the depth of such extension being dependent entirely on the duration of the vessel obstruction. Curiously enough, the lesions were seen to occur only in the areas supplied by these vessels and did not extend over the entire surface of the mucosa. That is a segmentary inflammation, as the author terms it. He says that while he does not wish to be understood as claiming that spasm of the blood-vessels invariably produces an attack of the appendix, it is nevertheless significant that it plays quite a rôle in its causation.

FRED C. ZAPFFE.

Diagnosis and Treatment of Acute Inflammation of the Upper Abdomen. A. W. MAYO ROBSON. *British Medical Journal*, January 10, 1910.

After taking up briefly the general etiological factors and presenting a graphical clinical picture of the typical cases, the author considers the more important points in the diagnosis and treatment, which in brief are as follows:

As to diagnosis. High appendicitis. Pain in the region of the liver, but rigidity and tenderness most pronounced in the appendical region. Cholecystitis. History of ancient attacks is important. Absence of jaundice not a factor. Gall-bladder may be obscured by enlarged liver. Perforated duodenal ulcer. Suppuration indicates subacute perforation. In most cases pain in region of appendix. Acute pancreatitis. History of gall-stones; urinary reaction; fat necrosis. Jejunal ulcers. Almost always dependent on previous peptic ulcer and post-operative in character.

After treatment. Particular points brought out are:

In the cases diagnosed as high appendicitis, the benefit of a long vertical incision, preferably one inch to the right of the median line, thus permitting of a thorough exploration and limiting the dangers of hernia. The advantages of cholecystostomy over cholecystectomy, the latter only to be used in gangrenous and similar perforated cases as a rule.

Suturing of perforated peptic ulcers without gastroenterostomy, unless in the presence of a severe pyloric

obstruction. Drainage of lesser peritoneum in acute pancreatitis. Cancerous suppuration as a contra-indication to any radical measures. Value of surgical interference in acute gastric dilatation.

The principles of treatment of this class of disorders as outlined by the author may be summed up as follows: prompt surgical interference; free incision and drainage; and careful post-operative treatment.

GORDON T. COURTENAY.

Observations on the Course and Outcome of Kidney Tuberculosis (Beobachtungen über Verlauf und Ausgang der Nierentuberkulose in einer Anzahl vorgeschrittener, der Mehrzahl nach nicht operierter Fälle). G. EKEHORN. *Nord. Med. Arkiv.*, 1909, b. xlii (Kirurgi), h. 1 and 2, Nr. 3.

This study is based on thirty-three cases divided as follows: Four cases of advanced tuberculosis of the kidney still living and not seen after leaving the hospital; eight cases still under observation; five cases dead without post-mortem; ten cases dead with post-mortem; six advanced cases operated. The report is meant to show the ultimate result of untreated tuberculosis of the kidney. The course of the disease when uninterrupted is on the average about six years. Pathologically two types were predominant, the ulcerative, which eventually left a lobulated sac filled with detritus, and a sclerosing type where the kidney was very markedly contracted.

In regard to the localized tuberculosis of the kidney, Ekehorn asserts that the pelvis of the kidney is anatomically divided into an upper, lower, and intermediate compartment, the divisions being more defined in some cases than in others. Where the tuberculosis is localized it corresponds to one of these divisions. Ekehorn thinks that one conclusion to be drawn from his statistics is that each case should be operated when diagnosis is made, although a case may rarely heal out through sclerotic change in the kidney, and healing of ureter and bladder lesions. C. G. GRULEE.

Remarks Concerning the Variations in Viscosity Due to Surgical Operations (Untersuchungen über Änderungen in der Blutviskositæ infolge von Chirurgischen Operationen). GUISEPPE BOLOGNESI. *Zentralblatt f. Chir.*, No. 34, 1909.

Observations Concerning the Blood Viscosity in Surgical Diseases and Operations (Untersuchungen über Blutviskosität bei Chirurgischen Kronkheiten und Operationen). WALTER MÜLLER. *Zentralblatt f. Chirurgie*, No. 41, 1909.

The clinical observations of Bolognesi were made with a Hess viscosimeter on surgical patients before and after operation. Care was taken that the diet should be such that it would not influence the results. Determinations were made 24, 48, and 56 hours before, and six to forty-eight hours after operation.

Hess has fixed the normal average at 4.6, when his instrument is used. The cases were of all types, infections, malignancy, hernias, etc. B. found the viscosity to range from 4.4 to 5.9 before, and from 4.8 to 6.6 after operation, an average rise of 0.6.

He observed usually a rise in temperature and leucocytes, but not always, and, in some cases a rise in these was accompanied by a fall in viscosity, and vice versa — showing that the viscosity does not depend upon the leucocytes.

B. mentions that certain physiological conditions (old age and meat diet) as well as certain pathological processes, such as gangrene and infections, cause a rise in viscosity. The author fancied that the various anæsthetics used had no influence on the changes in viscosity. A table is given showing the changes in viscosity, temperature, and leucocytes before and after operation, in each case.

Müller's conclusions are based upon about 1,050 observations made upon 230 surgical patients. The viscosity of the blood depends upon:

1. The number and hæmaglobin content of the erythrocytes.
2. The albumen content of the serum. (The salts of the blood play no part.)

After aseptic, intraperitoneal operations, he noted the following changes in the viscosity which follow a fairly regular curve:

1. A post-operative rise reaching the maximum at the end of about twenty-four hours.
2. A gradual fall, during the next two or three days, to normal.
3. A further fall during the next two or three days below normal.
4. A secondary rise to normal The changes occupy a period of from six to eight days.

These changes accompany a proportionate rise and fall in the number of red cells and their hæmaglobin content. There is usually an accompanying change in the number of leucocytes, but this does not affect the viscosity. The cause of the erythrocyte increase is probably a stimulation of the blood forming organs by the operation, not by the anæsthetic.

Traumas and acute infections of the soft parts are shown to have the same effect on the viscosity. In chronic infections, a rise in viscosity does not occur — a fall being the rule. Acute peritoneal infections, chronic peritonitis, chronic bone infections, cause a fall in viscosity.

In patients with an already high viscosity, there may be a still further post-operative rise. The usual rise may be absent after very severe prolonged operations.

Increase in the viscosity is noticed after acute intestinal obstruction, but is hardly influenced by loss of fluid by perspiration or cathorsis. The observations were made with a Hess viscosimeter.

J. F. CHURCHILL.

Gastroenterostomy or Resection in Ulcus Ventriculi (Gastroenterostomie oder Resektion bei Ulcus Ventriculi). HOCHENEGG. *Wiener Klinische Wochenschrift*, b. xxiii, 52.

Hochenegg believes that gastroenterestomy is much less dangerous than is resection, that it brings about a cessation of the symptoms whether ulcer is located near the pylorus or in the fundus, and that it is a better protection against recurrence. C. G. GRULEE.

Analysis of 197 Cases of Duodenal Ulcer Operated upon by Mr. Moynihan, 1900-1908. HAROLD COLLINSON. *Proc. Roy. Soc. Med.*, 1910, iii, Surgical Section, 79.

A statistical review. Eleven cases of perforating ulcer, three deaths; one hundred and eighty-six cases chronic ulcer, one hundred and thirty-nine cases of duodenal ulcer alone, forty-seven cases of both gastric and duodenal ucler. One hundred and thirty-one cases between years of twenty and fifty. Hæmorrhage was present at some stage in 37.6 per cent. Tetany in three cases. Cardiospasm in three cases. Seventy-eight were treated by posterior gastroenterostomy with simple suture and eighty-four cases with infolding of ulcer and posterior gastroenterostomy, on the others various operative measures were resorted to.

Mortality, 2.15 per cent. Four other patients have since died of various causes, 79 per cent were cured. Post-operative vomiting occurred in twelve cases.

C. G. GRULEE.

A Pessary for Prolapse of the Rectum (Contención del Prolapso Rectal). E. MONTURIOL. *Archivo de Ginecopatía, Obstetricia, y Pediatría*, October 10, 1909.

The author uses the following improvised pessary in cases of rectal prolapse in children.

A rubber tube about 8 to 10 cm. long and 2 cm. in diameter is used; one end is carefully trimmed of all sharp edges; to the other end are sewed two short bandages. After reduction of the prolapse this tube is inserted, smooth end first, and the bandages passed up in front and behind the thighs and fastened to an abdominal binder. A wooden obturator is then inserted, a hole in its outer end allowing it to be fastened to the binder by a third bandage. This obturator prevents the constant escape of gas and fæces and can be removed for defecation. After a day or two the child becomes accustomed to the appararatus and is able to run about without any great inconvenience from its presence. The tube is changed every day or two, different lengths being used to prevent constant chafing of the same part of the mucosa.

The author reports several complete and permanent cures from the use of this pessary. B. J. O'NEILL.

An Experimental Study of Opsonic Immunity to Staphylococcus Aureus. J. C. MEAKINS. *Journal of Experimental Medicine*, xii, 67–81.

The writer conducts a series of experiments on rabbits and finds that the phagocytosis of animals treated with staphylococcus aureus vaccine is markedly increased over that of those treated with normal serum. The animals treated with vaccine, and then inoculated with virulent staphylococci, live much longer than those not treated with the vaccine. Those treated with the vaccine lived from 5 to 45 days while those not treated all died within 36 hours. Also shows that "opsonins produced by vaccination with one strain of staphylococcus aureus are very powerful in promoting a phagocystosis of heterologous strains, but have a somewhat greater power against the homologous strains."

He recites two human cases with good results as result of the vaccine treatment.

Conclusions:

1. The administration of the staphylococcus aureus killed by heat (vaccine) produces a high degree of opsonic immunity in rabbits.
2. Such increase of opsonins affords protection against the living virulent staphylococci in direct proportion to the amount of opsonins present in the serum and complete recovery may follow subsequent inoculation if the opsonic power be high.
3. Frequent administration of vaccine may produce a diminution of the opsonic power of the serum.
4. Immune opsonins are most active against the homologous strains of staphylococcus aureus but are only slightly less active against heterologous strains.
5. Infections of the human body by staphylococcus aureus may cause great increase of opsonins.
6. Vacinnes prepared from staphylococcus aureus may produce a high degree of opsonic immunity in man.

JOHN A. WOLFER.

Remarks on Appendix Dyspepsia. B. G. A. MOYNIHAN. *British Medical Journal*, January 29, 1910.

In a very interesting article Mr. Moynihan discusses a class of cases commonly known as "dyspepsia," and usually diagnosed as a disorder of the stomach—frequently gastric ulcer. He points out the fact that careful study of and operation upon a number of these patients has revealed nothing but a chronic adherent appendix, often accompanied by pyloric spasm, which he thinks to be of a reflex nature.

Removal of the appendix has been accompanied by recovery.

In a typical case of this type there is a history of pain, usually occurring about an hour after eating, located in the epigastrium, and with no interval of relief. Vomiting is common and may be bloody, and the stomach contents show increased H. Cl. Often there is tenderness over the pylorus. The history dates over a long period of time.

The author finally concludes:

1. Symptoms of gastric or duodenal ulcer, especially the former, may be exhibited in cases manifesting no structural charge.
2. In many cases of so-called gastric ulcer or dyspepsia the only pathological change at operation is a chronic appendix.
3. Its removal brings relief.
4. No operation for gastric ulcer is complete without thorough abdominal search.
5. Where no stomach lesion is found, do not perform gastroenterostomy.
6. Mimicry of symptoms is due to pyloric spasm.
7. Investigation is necessary to determine frequency with which mucous erosion of stomach is dependent upon appendix or intestine. Several cases are reported.

GORDON T. COURTENAY.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF GYNECOLOGY

UNDER THE CHARGE OF

J. CLARENCE WEBSTER, M. D. — E. C. DUDLEY, M. D.
J. C. HOLLISTER, M. D. — GEO. DE TARNOWSKY, M. D.
GERRY R. HOLDEN, M. D. — CAREY CULBERTSON, M. D.

The Removal of Extremely Large Tumors of the Small Pelvis by Means of Resection of the Ramus of the Pubes and the Symphysis (Die Entfernung Übergrosser Tumoren des Kleinen Beckeus mit Resektion des Schambeins und der Symphyse). PROF. HERMANN KUTTNER. *Beiträge zur Klinischen Chirurgie*, bd. 60.

Küttner reports two cases of very large tumors impacted in the pelvis, which he was enabled to remove by resection of the pubic rami. One of these was a subperitoneal fibroma, the other a pelvic enchondroma, both of them being larger than the adult head.

In the operation for fibroma the entire symphysis as well as a portion of the right pubic bone and ramus were resected. In this case also a portion of the bladder was resected on account of adhesions to the tumor. In the case of the enchondroma, a portion of the pubes 2–3 cm. wide was excised. In both cases a simple cutting through of the pubis, or hebotomy, did not suffice to give access to the tumors, so that a resection had to be made. The neoplasms were extirpated by morcellement. The pelvic defects were allowed to remain. The interesting feature is, as Küttner states, that, in spite of the amount of bone removed, the patients did not show any change in their ability to walk. The woman from whom the greater portion of bone was removed was able to stand upon the leg of the resected side. The functions of the pelvic organs were not disturbed. Küttner presents the cases as a suggestion as to increasing the accessibility of such new growths. W. C. DANFORTH.

Gelatinous Cystomas of the Ovary and the Gelatinous Peritoneal Changes Occurring in their Rupture, *Pseudomyxoma peritonei* (Über die Gallert kystome der Ovarien und die bei Ruptur auftretenden gallertigen Veräunderungen des Bauchfells s. g. *Pseudomyxoma peritonei*). E. AHLSTRÖM. *Nord. Med. Arkiv.*, 1909, b. xlii (Kirurgi), h. 1 and 2, Nr. 1.

After an exhaustive review of the literature Ahlström reports twenty-eight cases from the Scandinavian clinics, in nine of which complete microscopical reports are given, in the other nineteen the clinical observations are given and in three of these microscopical report of the original tumor.

In taking up the pathology of the condition he makes many interesting observations. Among his opinions may be mentioned the following:

In the secondary tumors occurring in the peritoneum and elsewhere the epithelium quickly degenerates. The gelatinous cystoma is an entity distinct from the pseudomucincystoma. The so-called myxomatous degeneration is really an invasion of the connective tissue by the gelatinous substance to which the connective tissue offers little resistance, and as a consequence is destroyed. Rupture of these cysts is brought about by two factors: (1) the wall is thin and poor in elastic tissue, (2) the invasion of the wall by the gelatinous substance. The gelatinous cystoma of the ovary is frequently bilateral and is intraligamentous in 20 per cent of the cases.

In a majority of the cases the peritoneum is the seat of larger or smaller gelatinous tumors. In most of the cases the changes in the omentum are not on the surface but in the substance and are likely due to the penetration of the gelatinous substance into the lymph spaces of that organ. Gelatinous masses may act in the peritoneum like foreign bodies being enveloped in a connective tissue capsule, but the connective tissue capsule is rich in cells and blood-vessels and not like the connective tissue of the cyst wall. Epithelial metastases are present in the peritoneum in at least 50 per cent of the cases. The epithelium of the metastases exerts a specific influence on the connective tissue surrounding it rendering it similar to that of the original tumor. Non-striated muscle also shows this same lessened resistance. In one of his cases (case 5) the lymph glands of the abdominal cavity, above the diaphragm, and in the inguinal region, were invaded by metastases. (The only case on record.) He thinks that the subperitoneal metastases are formed in two ways: (1) by direct sucking of the epithelium into the lymph spaces and (2) by the growth of the epithelial cysts deeper into the tissues. In three of the cases metastases occurred in the appendix. It is not possible to say whether the cyst occurring in the other ovary is an implantation cyst or a new growth.

In 84.4 per cent of his cases and those collected from the literature, the patients were over forty years of age. In 75 per cent of the cases the clinical symptoms were less than a year in developing. Rupture is attended by no suddenly occurring subjective symptoms. Of

Ahlström's cases (twenty-eight primary and five secondary ovariotomies) four died (1 operation undertaken as a palliative measure). Deaths due to purulent peritonitis, 1; ileus, 1; and acute nephritis, 1. Of those cases having epithelial metastases at least a third show increase of these tumors.

Late recurrences are not rare, one coming after nearly ten years, therefore a cure cannot be pronounced three years after ovariotomy even if the patient shows no sign of recurrence. In 38 per cent of his cases (twenty-one cases reckoned) the patients remained well after six years. In those cases where only deposits of the gelatinous substance are found the prognosis is good, but if macroscopic gelatinous cysts remain the prognosis is doubtful if not altogether bad.

Ahlström believes to have established that the "organization" process is a healing process while in the formation of the epithelial metastases the true danger lies.

The article is really a monograph on the subject and justice cannot be done it in the space of a short abstract. C. G. GRULEE.

Bacteriological Researches Anent the Applicability of Tincture of Iodine as a Skin Disinfectant (Recerche Bacteriologiche sulla applicabilita della tintina d'Iodio, quale disinfettante della cute). DR. ATTILIO LOIACONO. *La Genecologia Moderna*, September, 1909.

Loiacono conducted a series of experiments with a 12 per cent alcoholic solution of tr. iodine in order to determine its penetrability and antiseptic power on the skin, guinea pigs were used, sections of their skin being made and examined histologically. In one series of cases the skin was first shaved, then scrubbed with soap and water followed by alcohol and ether; in a second series the skin was merely dry shaved and the tr. iodine applied immediately without any further disinfection. In both series it was found that there was equal penetration, involving only the epidermal stratum.

Desirous of finding a solution having greater penetrability, Loiacono conducted a third series of experiments on guinea pigs, using a solution of equal parts of alcohol and acetone with 12 per cent iodine.

RESULTS

Tr. iodine alone. Penetration of epidermis slower.

Tr. iodine in alcohol-acetone. Complete penetration of entire cutis with diffusion throughout the subcutaneous tissues.

Bacteriological investigations were not carried out in order to determine the effect of iodine-alcohol-acetone on bacteria found in the skin. The results showed that the solution had no inhibitory power on bacterial growth.

The influence of the iodine-alcohol-acetone solution in the prevention of bacterial growth was also negative in a series of cases in which b. prodigiosus, b. pyocyaneus and staphylococcus were artificially implanted in the skins of monkeys and guinea pigs. Loiacono concludes from his researches that:

1. The disinfection of normal epidermis by means of iodine or iodine-acetone, as regards the destruction of pre-existing bacteria, is impossible.

2. The destruction of bacteria artificially added to the epidermis is only partially complete.

3. The use of tr. iodine may in certain cases tend to diffuse infection.

4. Of clinical importance is the fact that certain bacteria such as the bacillus diphtheriæ, while destroyed in culture-media by tr. iodine, are only slightly or not at all affected by the same solution when growing on the epidermis. GEORGE DE TARNOWSKY.

Mammin Pohl, a New Treatment of Fibromyoma and Chronic Inflammation of the Uterus (Mammin Pohl als neue Behandlungs-methode bei Fibromyomen und chronische Entzundungen der Gebarmutter). DR. MEKERTTSCHIANTZ. *Monats. f. Geb. u. Gyn.*, b. xxxi, h. 1.

Mammin pohl is not a chemical unity but a synergic group of substances of the mammary glands. It differs from other mammary preparations in not containing toxic substances.

After using this preparation in 26 cases the author concludes:

1. Given per mouth in tablets of 8 to 10 grains 2 to 6 times daily with meals, mammin pohl will produce diminution of the fibroma; it stops or diminishes hæmorrhages, regulates menstruation, strengthens the body. Its use is a rational, therapeutic method.

2. Every fibromyoma ought to be treated at least 1 to 2 months if immediate operation is not indicated, and operation only resorted to if the drug is not effective. In cases of heart trouble, Bright's disease, or other contraindications to operation, it is the only rational treatment.

3. In cases of chronic metritis it will remove congestion of the uterus, produce contraction of its muscles, it regulates the menstruation, decreases pain and fluo, and improves the general condition.

4. In some cases the subcutaneous application becomes necessary. Some patients took the drug over one year without harm. HELIODOR SCHILLER.

A Case of Gangrene of the Leg Following Abdominal Hysterectomy (Un Caso de Gangrena de la Extremidad Inferior Despues de una Histerectomia Abdominal). DR. GUILLERMO RIBAS. *Revista de Medicina Cirujia, Barcelona*, December, 1909.

A woman of 26, otherwise in good general condition, was suffering with double pyosalpinx, which continued to grow worse with palliative treatment, so that an operation was finally made in spite of a temperature running about 39° C. The conditions were found to be such as to necessitate removal of the uterus and adnexa. Three days later the patient began to have severe pains in the toes of the left foot, followed by a slowly developing progressive dry gangrene, making amputation necessary five weeks later. An acute nephritis developed and the patient died with uræmic symptoms ten days after the amputation. The cause of the gangrene was found to be an infective endarteritis.

B. J. O'NEILL.

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PATHOLOGY AND CLINICAL SIGNIFICANCE OF STOMACH ULCER

FROM A STUDY OF THE MATERIAL FROM 216 PARTIAL GASTRECTOMIES FOR ULCER, ULCER AND CARCINOMA, AND CARCINOMA

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IN the history of the study of ulcer another period may be recorded, and that is, the observation of ulcer in the living individual as seen at operation and immediately after removal. With the improvement of legal right and individual submission to more scientific examination, trained observation, and surgical dexterity, our knowledge has increased in a systematic and orderly manner until to-day we are in a better position to confirm and add to the remarkable observations and records of Baillie, Abercrombie, Cruveilhier, Morgagni, Rokitansky, Müller, Heitler, Waldeyer, Hauser, Welch, and others in passing successively from purely autopsy findings, and autopsy and clinical findings, to the immediate examination of early ulcers during and after resection.

The cases herewith presented are a part of the material examined freshly within two minutes after removal from two hundred and sixteen resections of the stomach for ulcer, ulcer and carcinoma, or carcinoma, in the clinics of Drs. W. J. and C. H. Mayo.

The material divides itself grossly and microscopically into three groups. These groups comprise two hundred and sixteen cases, fifty-eight of which are ulcers, one hundred and twenty-five ulcer and carcinoma, and thirty-three carcinoma without any good evidence of ulcer. The last two groups will be considered in this paper. Group one comprises cases which, at operation, were ulcers which were resected for ulcer with possibly carcinomatous borders. Upon examination, grossly and microscopically, no evidence of carcinoma was found. Group two is considered here because the specimens present all the characteristics of ulcer grossly and microscopically, with the additional feature that the borders contain definite areas of carcinoma microscopically. Specimens in this group show the base of the ulcer free from carcinoma and consisting only of granulation and scar tissue. In order to show that up to the present time we cannot say absolutely that all gastric carcinomata develop on ulcer and that some ulcers do show carcinomatous remnants in the base, and may be ulcerated primary carcinomata, it may be well to show some advanced cases of ulcer and carcinoma. From the pathological standpoint during the observations the following questions arose:

What is the life history of gastric ulcers, e. g., how do they begin, progress, and terminate? What are the gross and microscopical characteristics, and how do they differ from the so-called ulcerated, gastric carcinomata?

From a clinical diagnostic standpoint: Can one be sure that one is dealing with the simple ulcer, and what are the chances for its not being a simple ulcer? From a therapeutic

Fig. 1. (Case No. 18088.) Multiple gastric ulcers.

standpoint: In a case with a typical ulcer history what are the chances that the medical or hygienic measures are combating a condition which we know is certainly incurable by such measures? At operation what are the difficulties in making a differential diagnosis between a benign ulcer and a malignant ulcer?

Technique. Immediately after the removal of the specimens, frozen sections were made and stained with Unna's polychrome methylene blue. With this method[1] a more accurate and more beautiful picture may be had than by staining with hæmatoxylin and eosin. They contain less artifacts than would be expected, and do occur after hardening in formalin, dehydrating in alcohols, and clearing in the various clearing fluids.

Blocks were taken from every specimen and hardened in ten per cent formalin, twenty-four hours, frozen, cut, and stained with hæmatoxylin and eosin for comparison and record. The gross specimens were fixed according to Melinkow's modification of Kaiserling's method of preserving color or in ten per cent formalin.

CASE No. 18088 (Figs. 1 to 8). A male, aged forty-five, who twenty years ago had three attacks of inflammation of the bowels, during a period of nine months, and was in bed about a week with each attack. He had severe pain over McBurney's point lasting three days. This was severe enough to cause vomiting. The point

[1] Wilson, Journal American Medical Association, December 2, 1905.

Fig. 2. (Case No. 18088.) Gross section through four of the ulcers showing various degrees of extension of the process of erosion into the coats of the stomach wall.

was tender, the soreness lasting about three days after patient was out of bed. Four years ago he had some pain and soreness, especially after exertion. About seven or eight months ago there was again tenderness over McBurney's point; it came on at eleven A. M. and four to five P. M., and continued until salty water ran out of the mouth. The patient would then vomit; the vomitus was sour and bitter, four months ago it became bloody. Three days ago a tumor was noticed in the epigastrium. His weight decreased sixty pounds. He complained of gas one to two hours after meals. Belching of this gas gave no relief. The pain often radiated to the loin. At operation three-fourths of the stomach and the lesser curvature were resected for cancer and multiple ulcers. The resected portion contains five simple ulcers and one malignant ulcer varying in size from 3 mm. to 2½ cm. in diameter. The largest of these (Fig. 1,2, c) ulcers is about one-half cm. in depth, and has a base which extends partially through the muscularis and is covered to the extent of one-half mm. with necrotic tissue. The next largest ulcer which is 2 mm. in depth, does not extend to the muscularis, but rests upon a chronically inflamed submucosa, which is composed of dense scar tissue. The ulcer

Fig. 3. (Case No. 18088.) Microphotograph through ulcer (a) Figs. 1 and 2.

(b) is 2 mm. in depth and 6 mm. in diameter and rests upon a chronically inflamed submucosa. There is no apparent hypertrophy of the mucosa, but it does project over the edge of the ulcer cavity. The bases of the two larger ulcers are composed of dense connective tissue, along the surface of which are found lymphocytes and necrotic connective tissue. Throughout this connective tissue mass and extending into the mucosa are numerous aggregations of lymphoctytes. There is no evidence in the mucosa of any irregularity in the glandular arrangement; however, a few of the cells of the individual glands show marked irregularity in size. These, however, cannot be said to be carcinoma. In no portion of the border of any of the ulcers is there any trace of epithelium dipping below the mucosa into the submucosa. The nuclei are apparently regular in shape and size in all areas examined, excepting the one small area described above. The smallest ulcer (Fig. 1, 2a, 3) does not extend below a depth greater than half that of the mucosa. Epithelial cells or remnants of glands may be seen in the base of this ulcer. The base is composed of dense connective tissue, which extends through the mucosa and submucosa. The muscularis mucosæ is almost completely intact, with narrow strands of connective tissue penetrating it. The glands in the border of this small ulcer are regular in shape, and have nuclei which show no irregularities. The mucosa is infiltrated with lymphocytes in great numbers. One centimeter from the border of the ulcer is a definite chronic gastritis.

In this specimen we have "erosions" in various stages, from a partial destruction of the mucosa to complete destruction of the mucosa and involvement of the muscularis. Whether or not the gastritis seen in the mucosa bordering the ulcers is secondary to the condition which caused the ulcer, or is primary to the erosion

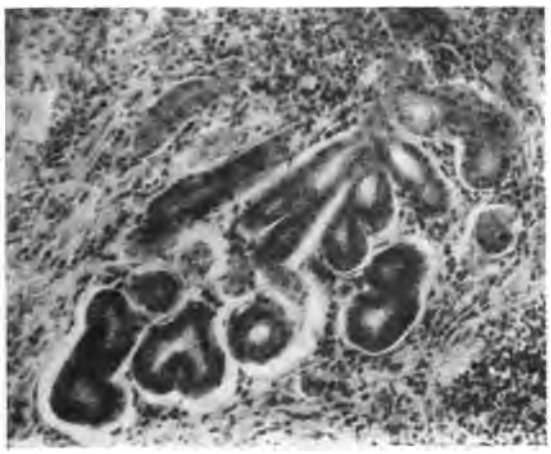

Fig. 4. (Case No. 18088.) High power microphotograph through the base of ulcer (a) Figs. 1, 2, and 3.

Fig. 5. (Case No. 18088.) Border of ulcer (b) in Figs. 1 and 2. (a) Apparent attempt to replace the lost epithelium.

is difficult, perhaps impossible to determine, the connective tissue elements apparently being of the same age and structure.

CASE No. 28173 (Figs. 9, 11), a male aged fifty-five. Four years ago he had "stomach trouble" with distress and belching of sour fluid and gas. For one year the patient's trouble was mild and then the pain became severe in the epigastrium and extended through to the back and left shoulder, but was more severe in the back. These pains came on two to four hours after meals, and were relieved by forced vomiting. The distress was also relieved by food or soda. There was never obstructive vomiting. The condition would be improved for a few weeks and worse for a couple of months. The pains grew gradually more severe. His appetite was good, his bowels were regular, and there was no jaundice. Loss of weight 15 pounds. Gastric analysis showed a total acidity of 70, free HCl 50, and combined HCl 10. The feces contained blood. The resected portion of the stomach is about 5 cm. in diameter and contains an ulcer 8 mm. in diameter. There is no gross evidence of hypertrophy of the border. A section through the center shows a conically-shaped erosion, at the base of which there is extensive connective tissue proliferation which radiates from the base, and which was apparently adherent to some neighboring organ. Grossly there is no sign of carcinoma. The erosion penetrates the muscularis and the scar tissue extends through the whole wall. Upon microscopical examination, the base is found to consist of scar tissue, which is necrotic on its internal surface, but without new blood-vessel formation. There are extensive aggregations of lymphocytes along the necrotic border, the lymph spaces are filled with lymphocytes and radiate from the center of the ulcer.

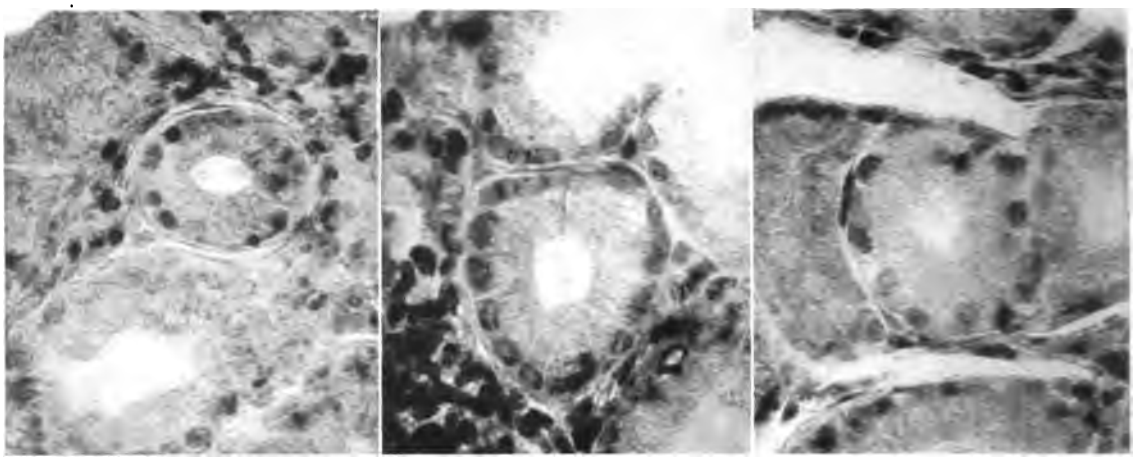

Fig. 6. Fig. 7. Fig. 8.

Figs. 6, 7, and 8. (Case No. 18088.) Microphotograph showing the regularity of the deeper glands of the mucosa in the borders of the ulcers.

The base of the ulcer shows no signs of glandular elements. The border of the mucosa is markedly infiltrated with lymphocytes. The nuclei of the glands are round and show no irregularity in form. There are no microscopical signs of carcinoma in the specimen.

CASE No. 25692 (Figs. 12, 13), a male, aged sixty, who came for consultation complaining of having suffered from shortness of breath and spells of pain, associated with vomiting of sour material. This was often relieved by food for three to five hours. At times the attacks became worse; milk and hot water at night eased the pain. There was no history of acute perforation. Tenderness was present over an epigastric area the size of the hand. During the past eighteen months he has used the stomach tube practically every day, and obtained some blood at times. He has had steady pain for two to three years. Appetite good, bowels sluggish. Gastric analysis showed a total acidity 70, free hydrochloric acid 52, combined hydrochloric acid 14, and food remnants. Hæmaglobin 82 per cent. At operation the pyloric end of the stomach was resected for perforating ulcer. This specimen contains an ulcer 1 cm. in diameter and about 7 mm. in depth. The mucosa overhangs the ulcer and is composed of glands, between which is an infiltration of lymphocytes. The nuclei of the glands are regular in size and do not show mitotic figures. The mucosa is sharply marked off from the submucosa. The base of the ulcer is composed of connective tissue containing masses of lymphocytes and remnants of glands. The nuclei of these glands remnants are small, round, and do not show any mitotic figures. A gross section through this ulcer shows a perforation of all the coats of the stomach by dense connective tissue.

CASE No. 27381 (Fig. 14). A male, aged thirty-four, who has had almost constant distress in stomach region for thirteen years. For four months at one time he had relief, the rest of the time distress, pain, gas, and sour vomiting occurred two to four hours after meals. Food or vomiting relieved this pain. The vomitus never contained blood. Loss of weight 45 pounds. There is a note in the history that the patient gives "a steady ulcer history." The pains were very severe but never prolonged. Gastric analysis revealed a total acidity of 42, free hydrochloric acid 25, and combined hydrochloric acid (questionable). At operation a chronic perforating ulcer of the lesser curvature, the size of a dime, was found. It had perforated into the head of the pancreas. The specimen is an ulcer of the lesser curvature 5 mm. in diameter and 5 mm. in depth. The base is composed of scar tissue and has a necrotic inner border filled with lymphocytes and leucocytes, and shows no evidence of new blood-vessel formation. There are no epithelial elements in the base. Aggregations of lymphocytes are present throughout the submucosa. The border of the mucosa is infiltrated with lymphocytes and leucocytes. There are no new formed capillaries in this border. The glands are composed of cells with round nuclei, which do not show mitotic figures, or any irregularity in size or shape. Between the cells large numbers of leucocytes are seen. No carcinoma is to be seen in the specimen.

CASE No. 30163 (Fig. 15). Female, aged thirty-nine, who was in bed four weeks with "inflammation of the bowels" about nineteen years ago. About two years ago severe pain in the epigastrium and sour belching occurred one and one-half to two hours after meals. Food gave no relief. There was soreness to the left of the vertebral columns during these attacks. Later she began to vomit. This condition became gradually worse and three or four years ago she began taking hospital starvation cure, which improved her condition. Her appetite was fair, her bowels were regular, but there was some loss in weight. Soda often relieved the pain temporarily. At the time of the patient's visit the pain came on two to three hours after meals, associated with much gas and distress which was relieved by vomiting and food. Gastric analysis showed

a total acidity of 52, free hydrochloric acid 38, combined hydrochloric acid 14. At operation there was found an ulcer 1 cm. in diameter and one-half cm. in depth upon the lesser curvature of the stomach. The complete ulcer was resected and examined immediately for carcinoma. It, however, shows only a deep erosion to the muscularis and a base in which there is an extensive infiltration with lymphocytes and scar tissue. In the base there is no evidence of glandular elements. In the immediate border of the mucosa, which projects over the edge of the ulcer, is an infiltration with round cells but no apparent hypertrophy of the glands. The glands themselves are regular in contour and are composed of cells with perfectly round or oval nuclei, showing no irregular mitotic figures or signs of regular or irregular hyperplasia. There are therefore no signs of carcinoma in the border. The base shows no evidence of granulation tissue. There are no new formed blood-vessels. It is simply a necrotic base. The lymph spaces extending from the border in the submucosa and muscularis are filled with lymphocytes.

CASE No. 30040 (Fig. 16), is a male, aged forty, who for ten years has had attacks of pain in the upper abdomen. At first these were not severe and were of short duration. The last three or four years these attacks became more frequent and more severe. They lasted from a month to two months, and occurred periodically with intermissions of about a month. During the periods of attack the pain was present every day, lasting one to two hours, and was severe enough to cause vomiting. The patient, at the time of consultation, was able to eat everything, but had considerable gas and had lost 30 pounds in the last three years. Food relieved pain for about an hour. He has never vomited bile or blood, but complained of sour eructations. Gastric analysis showed a total acidity of 58, free hydrochloric acid 40, combined hydrochloric acid 18, and blood present. At operation an ulcer of the posterior wall of stomach one and one-half inches below the cardia, and the size of a silver three-cent piece was resected. The ulcer is 6 cm. in diameter and 3 mm. in depth. The base is composed of scar tissue and necrotic material composed of lymphocytes and leucocytes, and shows no new blood-vessel formation, and no glandular elements. The border of the mucosa which overhangs the connective tissue border, is infiltrated with lymphoctytes, and is composed of glandular elements which show evidence of hyperplasia. The nuclei are round and oval and almost uniformly regular in shape but irregular in size. There are aggregations of lymphocytes throughout the subbasal tissue.

CASE No. 27919 (Figs. 17, 18), a male, aged fifty-three, who, at his first visit to the clinic, November, 1906, for two or three months had had occasional pain and ache from two to three hours in the gall-bladder region. This was associated with some gas and distress in stomach when he ate liberally. His appetite was good. The laboratory findings were negative. Ten years ago the patient had sour eructations and pain over liver three hours after meals. October 24, 1908, appetite was good; about three hours after food was taken he began to feel distress in epigastrium with sour eructations; always has gas and occasional vomiting, less than once a week. Soda, alkalies, eating, and irrigation gave relief. He had irrigated his stomach almost daily for years past. Recently he noticed food remnants in the washings. The gastric analysis showed a total acidity of 64, free hydrochloric acid 30, combined hydrochloric acid 14, fatty acids, and food remnants. A second gastric analysis two days later showed a total acidity of 90, free hydrochloric acid 28, combined hydrochloric acid 30, fatty acids, and food rem-

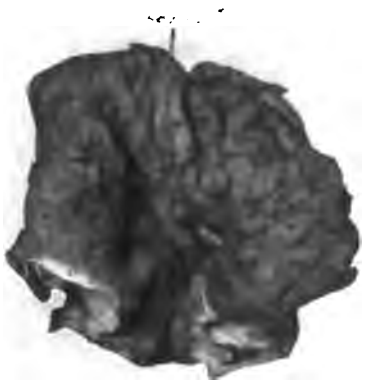

Fig. 9. (Case No. 28173.) Single gastric ulcer.

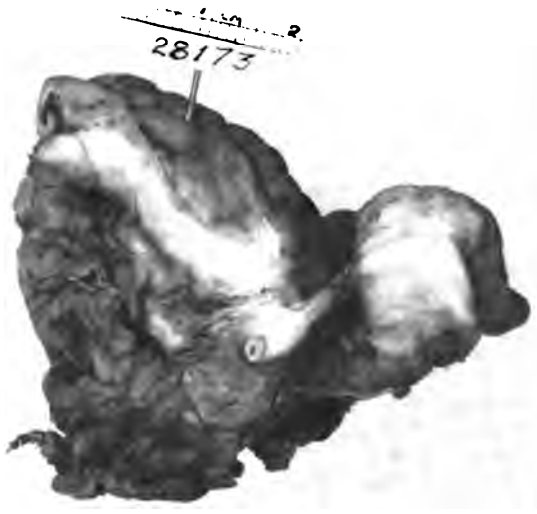

Fig. 10. (Case No. 28173.) Gross sections through the ulcer showing extension through all the coats of the stomach wall.

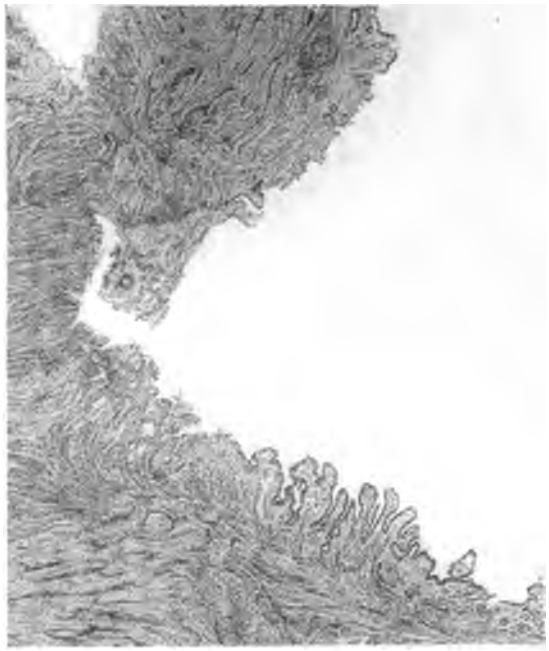

Fig. 11. (Case No. 28173.) Section through the ulcer showing the character of the border and the necrotic scar tissue base.

nants. At operation two ulcers at the pyloric end of the stomach on the posterior wall, one and one-half inches above pylorus were found. One was carcinoma. The specimen consists of a resected portion of the stomach, containing two shallow ulcers, each ulcer about 1½ cm in diameter and about 3 mm. in depth. They have not penetrated the muscularis. There is an increase in the connective tissue of the submucosa, but this increase does not extend to the muscularis. The glands of the mucosa are regular in shape and have nuclei which are round and show no irregular hyperplasia. The base of both ulcers consists of scar tissue. Beneath the mucosa in the scar tissue are islands of irregular epithelial elements. These small masses of carcinomatous tissue appear to have grown into the scar mass from the immediate edge of the ulcer below the inflammatory mucosa. The mucosa is infiltrated with lymphocytes with only occasional remnants of glands, the nuclei of which show mitosis and irregularity in size. The epithelial islands below the mucosa in this fibrous mass are typical epithelial glands, with the exception that they are irregular in form, and that the cells are irregular in size and show irregular mitosis.

CASE No. 21555 (Figs. 19 to 24 inclusive). A male, aged sixty-seven, who thirty-five years ago had dyspepsia, but nothing severe, and from then until two years ago had no trouble. At this time he began to have pain, associated with gas and sourness when his stomach was empty. He became gradually worse until four months ago when he began to vomit "sour stuff" and belch gas. He complained of distress in the epigastrium. There was "coffee grounds" vomitus at this time. In two years he had lost 35 pounds in weight, and most of this has occurred during the last four months. The gastric analysis showed hyperacidity and lactic acid present. One-third of his stomach was resected. The specimen contains an oval-shaped ulcer 3 cm. in its long diameter, about 1½ cm. in the short diameter, and 1 cm. in depth. A section through the ulcer shows that the base is infiltrated with lymphocytes and composed of connective tissue, which extends through the muscularis and peritoneum. The inner surface is necrotic and contains no epithelial elements, but here and there aggregations of lymphocytes. At a point just below the border is a definite area of perverted epithelium. This area grossly is definitely marked out from the rest of the base, and is the only area which shows carcinoma. It is definitely connected with the border of the mucosa and seems to be an outgrowth from it, which is itself composed of irregular hyperthrophic glands, between which is an extensive infiltration with lymphocytes. The epithelial nuclei of this portion of the border are irregular in shape and size.

This case is of great importance because in it we have the exact picture of ulcer as seen in the foregoing cases, with the addition of a definite area of carcinoma situated below the mucosa of the border, and definitely connected with the glands of the same, showing that this area is most probably an outgrowth of the glands in the border of an ulcer, rather than a remnant of an ulcerating carcinoma.

CASE No. 24527 (Figs. 25, 26). Male, aged fifty-three, who was examined on January 7, 1908, and who had complained for five months of vomiting, nearly every night for the past month, about bedtime. He

Fig. 12. (Case No. 25692.) Gross section through a single gastric ulcer.

had been eating three meals daily and felt no inconvenience through the day, but complained of gas between 8 P. M. and midnight, when he vomited a large quantity of partially digested food. He then felt comfortable until the next night. He has had no severe pain but has had some loss of appetite. There was no blood in the vomitus. He was always well until August. Hæmaglobin 67 per cent. Gastric analysis revealed a total acidity of 60, free hydrochloric acid 20, combined hydrochloric acid 20, fatty acid, but no blood. One-half of the stomach was resected. The resected portion contains a shallow ulcer about 4 or 5 cm. in diameter, and about 2 mm. in depth. The surface of the base is smooth and the mucosa gradually diminishes in thickness toward the base. A gross section shows that it has perforated all walls of the stomach and is infiltrated with carcinoma. Microscopically, one sees an eroded base containing carcinomatous tissue. The mucosa of the border is also extensively involved.

In this specimen we have an erosion of the mucosa and an involvement of all the coats of the stomach under the ulcer by carcinoma. It is impossible to say whether this ulceration was due primarily to carcinoma, or whether the carcinoma was due to an ulceration.

CASE No. 16651 (Figs. 27, 28). Female, aged forty-two, who sixteen years ago, five days after a confinement, was washing clothes, at which time she had a severe cramp in "stomach." During that summer she had cramps, which lasted from one hour to a day. Toward fall of the same year she began to vomit immediately or about two hours after meals. This vomitus was not sour, there was no blood and no pain. She had no gas from stomach until this last summer. Bowels usually regular. These same spells lasted until four or five years ago and then began to be less severe. For two years previous to last July she was perfectly well, ate everything, was hearty, strong, and worked steadily, weighed 142 pounds. Then she began to lose her appetite and felt weak and tired.

There was no pain. In August she began to belch as soon as food was taken; often the vomitus contained a previous meal. A tumor was palpable in the epigastrium. Hæmaglobin 27 per cent. Gastric analysis showed a total acidity of 50, no free hydrochloric acid, combined hydrochloric acid 5, lactic acid, blood, and fatty acids. At operation about three-fourths of the stomach were resected. The specimen contains an ulcer about 2 cm. in diameter and one-half cm. in depth, with a border which overhangs about 3 mm. Upon gross section, there is a connective tissue proliferation extending from the base to the peritoneum. The former rests upon the lower half of the musculature, through which it has almost completely eroded. In the base one sees grossly and microscopically carcinomatous areas, some of which have become partially eroded.

Fig. 14. (Case No. 27381.) Section through an ulcer showing the infiltration, destruction of the mucosa and the necrotic base.

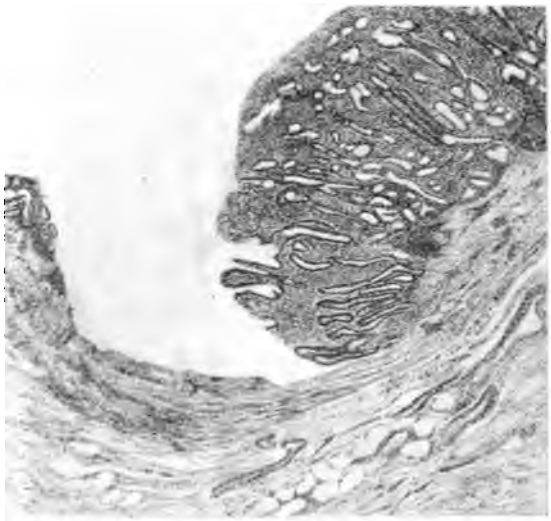

Fig. 13. (Case No. 25692.) Section through the border of the ulcer showing the overhanging hypertrophic border.

Fig. 15. (Case No. 30163.) Section through an ulcer with an extensively infiltrated base.

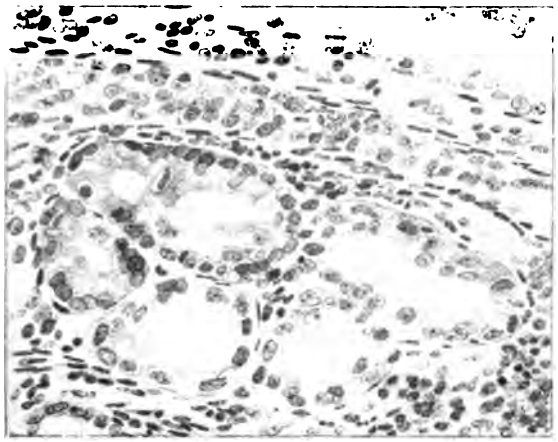

Fig. 16. (Case No. 30040.) Section showing the hyperplasia in the mucosa in an ulcer border.

In the overhanging border there is an extensive carcinomatous change with an hyperplasia of the glands and an infiltration with lymphocytes. The carcinomatous areas extend completely through the wall and the scar tissue of the perforation.

CASE No. 21882 (Figs. 29, 30). Female, aged thirty-eight. Eight years ago she was weak, tired, and worn out; four to five years ago she became weaker. About one and one-half to two years ago she had her first sickening pain. There was no nausea, no vomiting, but occasional sour eructations. About two weeks ago there was a severe pain in the back and left costal arch A tumor in epigastrium has been noticed for about seven or eight months; epigastric pain, gas, nervousness, weakness, and loss of flesh. Gastric analysis (second test) showed a total acidity of 50, free hydrochloric acid 30, combined hydrochloric acid 14. At operation two-thirds of the stomach were removed for carcinoma associated with ulcer. The specimen contains an ulcer from 3½ to 4 cm. in diameter and from 1½ cm. to 2 cm. in depth. There is a perforation of all the coats of the stomach, which has become adherent to neighboring organs. There is an extensive carcinomatous involvement of the ulcer base.

The specimen shows that the ulceration, although it might have started as a simple ulcer, has become deeper through the process of erosion of tissue composed of carcinoma. Such specimens have undoubtedly led to the belief that all ulcers which show carcinoma were developed in this manner. It is impossible to say whether or not this originally was an ulcer, or carcinoma with secondary ulceration.

Macroscopic description. Ulcers of the stomach vary in size from 1 mm. (Figs. 1, 2, 3) to several centimeters in diameter and from 1 mm. to 2–3 cm. (Fig. 30) in depth. They may be single or multiple (Fig 1). The base may be ragged or smooth. All of the ulcers in my series have rough bases because they were removed soon after an acute attack or in the stage in which mild inflammatory symptoms were present. The base contains elements of the mucosa, muscularis mucosæ, submucosa, or muscularis, depending upon the extent of the necrosis, as may be seen in Fig. 3, in which the smallest ulcer (Figs. 1, 2, 3) has eroded about half of the mucosa forming a base containing glands and infiltrated interglandular stroma. The largest ulcer in case No. 18088 (Fig. 2) involves the muscularis. On section through the specimen, the immediate base is seen always to be composed of connective tissue, which speaks perhaps for the gradual development of the ulcer instead of a rapid destruction below the muscularis mucosa. The initial erosion or necrosis of the mucosa may be of rapid formation, but the connective tissue base seems to show that the process is sufficently slow below the muscularis mucosæ for the formation of a temporary, if not permanent, barrier of scar tissue. Hæmorrhagic areas in the base are present in many ulcers in this series. The border of the mucosa which has the color of congested normal mucosa, does not always show evidence of hypertrophy, especially in small ulcers. In

Fig. 17. (Case No. 27919.) Section through a portion of the border of a benign ulcer.

the larger ones, which appear to be of long standing, the border of the mucosa projects or hangs over the edge and is almost always hypertrophic. When one examines a fresh ulcer in gross section there are four distinct coats visible: the mucosa, submucosa, muscularis, and subserosa. These are either eroded in the base of the ulcer or infiltrated with scar tissue (Figs. 1, 2). It is difficult and often impossible to detect epithelial growths in the wall of early ulcers (Figs. 18, 20). In many of such cases which, grossly, one is justified in calling an ulcer, early microscopic carcinomatous invasions from the mucosa exist (Figs. 18, 20).

Microscopic description (low power). The mucosa of an ulcer border rests on or is marked off from the submucosa by the muscularis mucosa, which is composed of two or three rows of muscle cells. The glands which are regular in shape in the border of some ulcers may be seen cut longitudinally or transversely (Figs. 3, 4). The demarkation between the glands and the interglandular tissue is sharp. There is a regularity in the arrangement of the component parts of the mucosa, which is best seen with low power. An infiltration with leucocytes or lymphocytes, or both, destruction of the glands, and invasion of the submucosa, may be readily seen with this power. The base is composed of dense connective tissue, the general growth of which is perpendicular, or nearly so, to the base (Figs. 2, 11). The base which extends to the border of the mucosa is infiltrated and necrotic (Figs. 14, 15). If there are remnants of irregular glands and the muscularis mucosæ has been destroyed or penetrated by perverted epithelium, one may be sure that carcinoma is present (Figs. 26, 28). If the base does not show these elements a careful search should be made for epithelial structures in the rest of the submucosa (Fig. 21). If such be present they should be studied for any irregularity in architecture, as seen in Figs. 22, 23. If perfectly regular (Figs. 16, 24) one may be dealing with an adenoma. If irregular (Figs. 22, 23) one is surely dealing with carcinoma. In the mucosa the differentiation between infiltrated tissue, inflammatory hyperplastic tissue, adenoma, and carcinoma is not always possible with a low power. The submucosa and mus-

Fig. 19. (Case No. 21555.) Single gastric ulcer with a carcinomatous border.

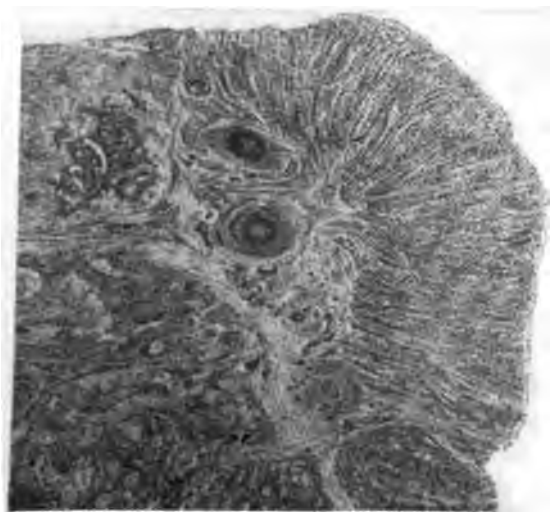

Fig. 18. (Case No. 27919.) Section through a portion of the border of a malignant ulcer, showing islands of carcinoma in the submucosa.

Fig. 20. (Case No. 21555.) Gross section through the ulcer.

cularis in ulcers and ulcers associated with carcinoma in the immediate vicinity of the lesion are infiltrated with scar tissue, and usually the lymph spaces are filled with lymphocytes (Fig. 15). Not infrequently aggregations of lymphocytes may be seen throughout the wall, especially in the mucosa and submucosa.

Microscopic description (high power). Groups of cells (Figs. 16, 22, 23) such as may be seen in a section through one gland should be studied with the high power to determine whether or not the border of an ulcer has passed beyond the stage of inflammatory hyperplasia. A study of the glands in this manner reveals the following conditions: In the smallest ulcer seen in Fig. 3, the bases of the cells rest regularly on a basement membrane and do not penetrate it. The relative proportion between the nucleus and the protoplasm is that of a differentiated cell and is about 1:3 or 1:4. The surrounding stroma is infiltrated with lymphocytes. The nuclei take the stain (Unna's polychrome methylene blue or hematoxylin) densely, and are either oval or round and vary in size and shape within the normal limits of normal gastric gland nuclei, depending on the plane in which they are cut. They are regular in shape and size. In the border of an ulcer which shows a more marked reaction to the irritant the same picture may be seen accompanied by more extensive hyperplasia (Fig. 16) and increase in the relative proportion of the size of the nucleus to protoplasm. The nuclei stain less densely. In this condition the line of demarkation between the stroma and the gland is usually not so regular. The glands may be and often are distended and distorted. In the same specimen in which such an hyperplasia occurs one may frequently see glands which are more irregular and possess all the characteristics of hyperplasia, with the addition that the nuclei are irregular in size and shape beyond the normal limits (Figs. 22, 23). Indeed some may be two or three times the size of the nuclei lying next to them. Such irregularity is seen

Fig. 21. (Case No. 21555.) Section through the hypertrophic border showing the ulcer characteristics and the invasion of the submucosa by hyperplastic epithelium of the border.

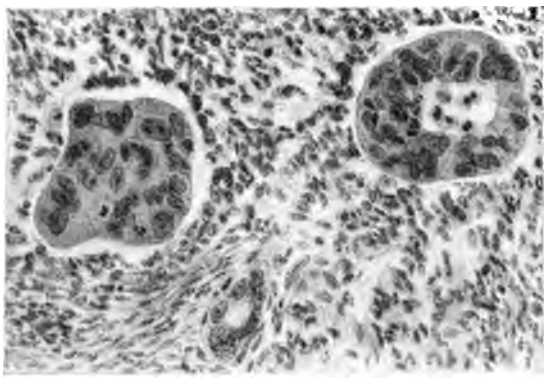

Fig. 22. (Case No. 21555.) Islands of carcinoma in the submucosa.

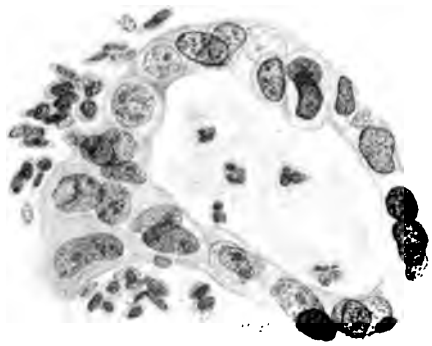

Fig. 23. (Case No. 21555.) Irregularly shaped epithelial cells in the border of the mucosa near the muscularis mucosæ.

in more extensive carcinomata and no hesitation occurs in making a diagnosis. Such a picture occurs in very early cases in the mucosa, before the submucosa has been invaded, and should be also considered carcinoma. One need not always wait for the basement membrane to be ruptured or invasion of tissue in which normally there is no epithelial tissue. There are many cases, however, in which the differentiation between hyperplasia and malignant hyperplasia is impossible at present on account of the apparent lack of demarkation between simple inflammatory hyperplasia and malignant hyperplasia. We are beginning to have it strongly impressed upon us that hyperplasia is a forerunner of malignancy, that hyperplasia varies in degree, and that carcinoma is a malignant hyperplasia which also varies in degree, and that some of the degrees, so far as the morphology is concerned, are indistinguishable, if not identical.

Ulcer and malignancy. The question, do ulcers become malignant as one of their sequelæ, seems, from my material at least, to be answered in the affirmative. What percentage heal, perforate, or become malignant is impossible to determine. The close association of carcinoma with ulcer may be strikingly seen in the fact that seventy-one per cent of all our resected specimens of the stomach for carcinoma were associated with definite ulcers (Wilson and MacCarty)[1] and that sixty-eight per cent of the resected ulcers of the stomach, including the duodenal ulcer, which rarely becomes malignant, were associated with carcinoma.

Ulcer process and life history of gastric ulcer. From a study of the morphology of ulcers it would seem that the process of ulceration, erosion, or necrosis manifests itself in single or multiple lesions, and that the initial lesion, at least in many cases, is a destruction of the mucosa itself, and that the reaction to this destruction is a connective tissue proliferation, and an attempt on the part of the epithelium of the mucosa to replace that which was lost (Fig. 5). The architecture of the connective

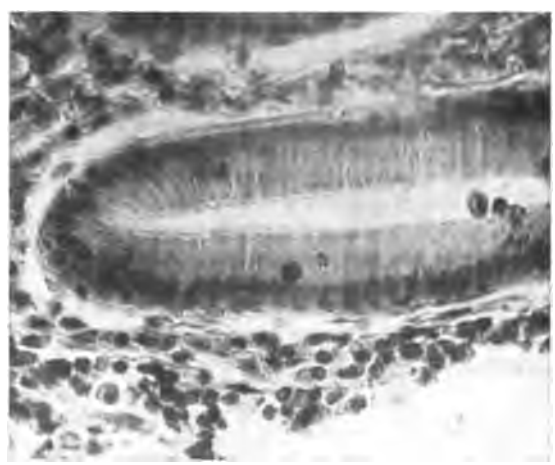

Fig. 24. (Case No. 21555.) Microphotograph of regularly shaped glands in the mucosa near the ulcer border.

[1] American Journal of the Medical Sciences, December, 1909.

Fig. 25. (Case No. 24527.) Gastric carcinoma.

tissue proliferation in the underlying tissue forming the base of all the ulcers studied in this series is such as to form an attempted barrier against further destruction. This barrier undergoes necrosis in the ulcer crater, thus increasing gradually the depth. If the base contains carcinomatous tissue, it too shares in the destruction (Figs. 26, 28). Perforation occurs by extension of the inflammatory process through the lymphatics, or by direct erosion, as may be seen in some acute cases. One may state the life history of gastric ulcer after the initial necrosis, the nature of which we do not know, as a gradual necrosis of the mucosa, muscularis mucosæ, submucosa, and subserosa. Ulcers heal, as may be seen at autopsy; they deepen and perforate as seen at autopsy and operation, or become malignant, as seen especially at operation. The last condition is often the sequel of ulcer, because we find ulcers which show no carcinoma, and ulcers which, grossly and microscopically, are exactly similar to the ulcers without carcinoma, but which contain small areas of irregular gland structures, with irregular nuclei, which show irregular mitosis. These islands of perverted epithelium may be seen in the dense scar tissue of the submucosa, just under and connected with the mucosa of the border (Fig. 21). Such ulcers do not present any epithelial elements in the base, and are therefore not ulcerated carcinomata.

CLINICAL DIAGNOSIS

The details of the clinical diagnosis will not be considered in this paper. While there has been a vague feeling from the pathological standpoint that carcinoma frequently occurs upon gastric ulcer, strong pathological evidence has been wanting. The clinician has for years noticed that carcinoma of the stomach often follows a prolonged history of gastric ulcer, and has believed that such was a forerunner of malignancy. The evidence, however, was only circumstantial. The fact established allows and demands a stronger admonition to the diagnostician who, as soon as he has diagnosed ulcer of the stomach, must consider the strong possibility of its becoming malignant. The chances of this occurrence may be readily seen, as stated above, in the fact that seventy-one per cent of our resected specimens of gastric carcinoma were associated with ulcer, and that sixty-eight per cent of our resected gastric ulcers were associated with carcinoma. It must be granted that gastric ulcers do sometimes heal with or without treatment, when seen early, or when not seen at all until autopsy, but unfortunately the early stage of ulcer cannot be so easily recognized.

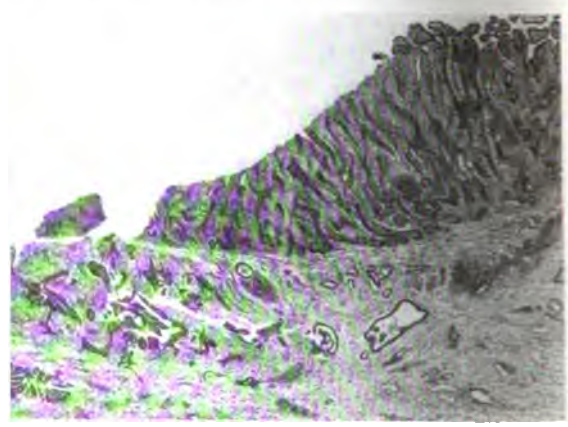

Fig. 26. (Case No. 24527.) Section through the border of the ulceration showing carcinoma in the border, submucosa, and the base.

and when recognized at the first definite sign or symptom it is impossible to determine whether the ulcer is a small one or a large one, or whether it has been present for weeks or months without having given rise to definite symptoms or even symptoms other than slight discomfort. Many cases with ulcers do not give a history of vomiting blood. As may be seen in cases 30163, 28173, 27381, 27919, 21882, 16651, 24527, many cases give a history of hyperacidity and do not show hyperacidity at the time of gastric analysis, and therefore absence of hyperacidity is of no value in a case which otherwise gives gastric symptoms. Lactic acid and fatty acids are not to be expected until there is mechanical or motor obstruction, which may occur associated with a small or a large ulcer, depending upon its location. The length of the history of epigastric discomfort or distress varies within wide limits, and the case with a short history often has a more extensive lesion than one with a long history. The lesion occurs most often, and practically always in early adult life or middle life. Our cases have occurred oftener in males than in females. A few, as may be seen in cases 18088 and 30163, give previous histories which appear

Fig. 27. (Case No. 16651.) Gastric carcinoma.

Fig. 28. (Case No. 16651.) Section through the border of an ulcer in which the mucosa, submucosa, and base are extensively infiltrated by carcinoma.

to be appendicitis. This coincident, if it be a coincident, is well worth considering however, as a possible etiological factor in view of some experimental and clinical experiences. Cannon has, by the injection of irritants into the large intestine, produced a retardation of the gastric discharge. Roger has shown that the injection of betanaphthol into the cæcum produces erosions of the mucosa. Litthauer has produced ulcers, which do not heal, by the production of localized anæmia and destruction of the mucosa. Clinically, many cases of appendicitis, especially chronic appendicitis, present symptoms of gastric disturbance which predominate those in the appendix region. Such cases, after the removal of the appendix are relieved and recover from the gastric symptoms. In these cases the stomach and duodenum present no lesion recognizable on exploration. These clinical and laboratory experiences are sufficiently striking to warrant further study and experimentation in regard to the possible production of pyloric spasm, gastric anæmia, hyperacidity, and necrosis or ulceration of the mucosa.

RESUME

1. Ulcers may be single or multiple and in different degrees of extension in the same specimen.

2. After the initial destruction of the mucosa,

Fig. 29. (Case No. 21882.) Gastric carcinoma.

Fig. 30. (Case No. 21882.) Gross section showing the great depth produced by the process of erosion.

there is definite deepening of the ulcer by necrosis.

3. This deepening is sufficiently slow to allow a dense connective tissue barrier against perforation to be formed.

4. Ulcers heal, perforate, and become malignant.

5. Perversion of the glandular elements occurs in the mucosa, and the cells then invade submucosa.

6. One cannot say positively that all carcinomata of the stomach have developed on ulcer, because carcinomatous tissue in the base of an ulcer may be an ulcerated primary carcinoma.

7. The length of the clinical history is no positive index of the extent of the lesion.

8. The absence of blood in the vomitus or gastric contents at the time of laboratory analysis when associated with gastric symptoms is not evidence against the presence of ulcer.

9. Absence of hyperacidity at the time of gastric analysis is also no evidence against the presence of ulcer.

10. Clinically, with our present means of diagnosis, it is impossible to say that a gastric ulcer is not malignant.

11. The intimate relationship between irritation in the appendix or cæcum and gastric disturbance may have some bearing in the etiology of ulcer.

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MIXED TUMORS OF THE UTERINE BODY[1]

By ISABELLA C. HERB, M. D., Chicago, Illinois

IT has been the generally accepted plan among pathologists to give tumors with a complicated structure a combination of names corresponding to the predominating tissue found. When, for instance, a growth is composed of different tissues so that each helps to make the structure of the tumor, it is given the name of the principal tissue, as adeno-chondro-sarcoma, adeno-myo-sarcoma, rhabdo-myoma, etc. Although these descriptive names have a simplicity to recommend them, they are to be discouraged, as they lead to wrong and conflicting ideas regarding the true nature of the growth. Tumors which, according to their etiology, development, and structure, certainly belong to the same group are given altogether different names. If it were possible to make serial sections of an entire tumor and select a name which would indicate all the kinds of tissue found, it might be acceptable, but this is impossible. In the majority of instances only small portions are examined and it is presumed that the entire mass corresponds to those parts. For example, tumors of the testicle which appear under the names of chondro-adenoma, adeno-cysto-sarcoma, etc., and kidney tumors found in childhood, are called myo-sarcoma, adeno-sarcoma, rhabdo-myoma, etc., and the growths in the salivary gland in which various tissues are found are given a variety of names in literature. Birch-Hirschfeld believes that certain kidney tumors belong to the same great group and has called them "embryonal glandular sarcomas." On account of the grape-like appearance of similar growths occurring in the cervix, Pfannenstiel suggested the name "traubige sarcoma." Others, notably Wilms, in his masterly monograph on mixed tumors, includes all growths which develop from more than one of the germinal layers, under the term of "mixed tumors." This includes not only the simple mixed tumors but the complicated dermoid cysts of the ovary and testicle.

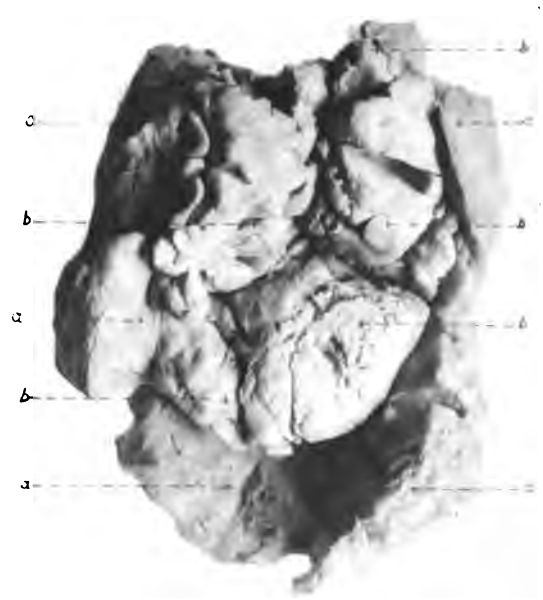

Fig. 1. *a*. Uterine wall. *b*. Tumor mass.

The genesis of these complicated tumors is still an interesting question. Bonnet believes that those occurring in the ovary are developed from the fertilized polar globules or from imperfectly differentiated blastomeres. Parthenogenesis has been suggested for the growths which occur in the testicle and ovary. Neither of these theories would account for the similar, but less complicated growths, which occur in other parts of the body. The two most common theories at present are metaplasia and Conheim's theory of misplaced embryonal tissue, the latter having the greater number of adherents. Wilms accepts this theory and believes that the complicated dermoid cysts and teratoid mixed tumors are developed from germinal tissue containing the three layers. He suggests that the displacement occurred during early fœtal life and that the varied structure is the result of irregular proliferation of the derivatives of the three layers. The various kinds of tissue do not reach the same

[1] From the Surgical Department, Rush Medical College.

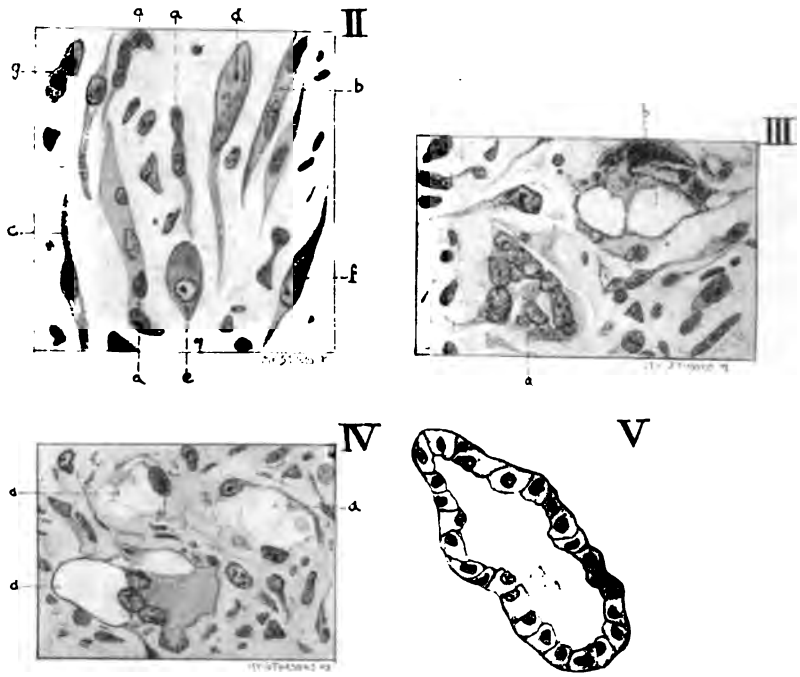

Fig. II. *a*. Elongated cells with multiple nuclei arranged in rows. *b*. Transversally striated cells. *c*. Longitudinally striated cell. *d*. Club-shaped cell with one end long drawn out. *e*. Cell with eccentrically placed nucleus and deeply staining eosin protoplasm. *f*. Spindle cell with vesicular nucleus. *g*. Mitotic figure.
Fig. III. *a*. Giant cell. *b*. Mass of chromatin and two vacuolated cells.
Fig. IV. *a*. Large vacuolated cells.
Fig. V. Cyst lined with cuboidal cells.

degree of differentiation, or the simpler forms may be composed of derivatives of two germinal layers. Experimentally transplanted embryonal tissue into animals of the same species has not been followed by tumor formation; however, this hypothesis seems best to fulfill all the requirements. It is difficult, nevertheless, to conceive how tissue can lie dormant in certain organs until middle life or past, although growths containing the same kinds of tissue in other organs always develop in early childhood. For example, whereas the most common kidney tumor of adult life is the hypernephroma, the most common in childhood is the mixed tumor; a large per cent of which develop during the first three years of life. Paul found this variety of growth in both kidneys of a seven month fœtus. The oldest patient found in literature was eleven years. (Perthes.)

This holds true of the growths occurring in the vagina. The age of the patients varies from one to three years. The oldest reported case was by Frau Kaschewarowa in a fifteen year old girl. Mixed tumors of the cervix occur after puberty; however, Pick reports a growth in a two year old, and Smith one in a four year old child, which they considered originated in the cervix, the vagina becoming secondarily involved. Those occurring in the uterine body were all in a women past the menopause and who had borne children. The congenital nature of the latter consequently are harder to explain.

Another question which confronts us is the much greater malignancy of the mixed tumors of the kidney, testicle, vagina, and uterus than those occurring in other regions. Mixed tumors of the salivary glands only exceptionally recur. The same is true of ovarian dermoids, which, according to some authorities, form 0 per cent of all ovarian tumors. Mixed tumors of the testicle and kidney usually recur within two years after removal, whereas those of the

uterus and vagina frequently recur within a few months, in marked contrast to the parotid growths which may be present for twenty to forty years. As a rule they recur locally and rarely form metastases; when they do the new growth frequently is composed of a single kind of tissue, usually the sarcomatous element. Eberth reports striated muscle in the metastases from a kidney tumor, and Wagner found tissue corresponding to the original cervical growth in a lung metastases. Metastases occur through the blood stream, the neighboring lymph glands usually remaining uninvolved. Tumor cells may penetrate the vessel wall and cause thrombosis.

These tumors when originating in the cervix scarcely ever involve the uterine body, but extend into the vagina and vaginal wall; on the other hand, those occurring in the uterine body rarely involve the cervix, but extend into the uterine cavity as a polypoid mass and penetrate, to a greater or less extent, the uterine muscle.

Inasmuch as mixed tumors of the uterine body are of rather infrequent occurrence, it was thought the following was worthy of report:

Mrs. C., 55 years of age, widow, mother of three children, had two premature births, cause unknown, has always enjoyed good health. Menstruation, which had been regular and painless suddenly ceased thirteen years ago. Present illness began eight months ago with pelvic discomfort. At present there is a profuse, watery vaginal discharge, which at times becomes quite hæmorrhagic. The patient is much emaciated and very weak. Pelvic examination reveals an enlarged uterus and considerable general pelvic tenderness. A small piece of tissue was removed by curette from the uterine cavity. A diagnosis of malignancy was made, but whether sarcoma, carcinoma, or both, could not be positively stated. The following day a supravaginal hysterectomy was made. Recovery was uneventful, the patient returning to her home in about three weeks. Regional recurrence, with death in six months after the operation.

Gross description (see Fig. 1). The specimen consists of the body of the uterus with intact right ovary and tube. The ovary is atrophied. The tube is patulous, somewhat enlarged and covered on its superior aspect by fibrous tags. The uterus, which has been amputated at the cervix, is enlarged, globular in form, and measures 10 cm. in length, 7.5 cm. in breadth, and 6.5 cm. in its anteroposterior diameter. The external surface is smooth, except at the top of the fundus where many fibrous tags are present, due to omental adhesions. Internally, extending from the fundus and region of the right tube, is a mass of rather firm consistency which fills the entire uterine cavity (Fig. 1, *b*). The surface of the growth is composed of polypoid excrescences measuring from 0.5 to 3.5 cm. in length, the tips of many appearing dark and necrotic, which no doubt accounts for the hæmorrhage. The remainder of the growth, which extends entirely through the uterine wall, is well preserved. The mucosa below its attachment is slightly thickened but otherwise appears normal.

Microscopical examination. Sections were taken directly through the growth and at various points throughout the mass, also from the uterine wall between the tumor pedicle and amputation stump. They were fixed in Orth's fluid and alcohol, embedded in paraffin and celloidin and stained by various methods. The growth which is very cellular is composed of elongated cylindrical cells, which occasionally form small bands or have more or less of a parallel arrangement. Many of these cells are unstriated, others show a transverse or longitudinal striation. The longitudinal striation extends as a rule throughout the cell (Fig. 2, *c*), while the transverse appear in only a part, frequently only showing at its borders (Fig. 2, *b*). The nucleus may be single or multiple and situated in the center of the cell or at one end in which case the end is club-shaped with the other end long drawn out (Fig. 2, *d*). The protoplasm is frequently vacuolated (Fig. 4, *a*). Elongated cells with multiple nuclei arranged in rows are occasionally encountered (Fig. 2, *a*). These cells are looked upon by some writers as due either to degeneration or indicate malignancy (Hunziker), but according to Weismann's theory (Minot Human Embryology) such an arrangement of nuclei probably marks the center of proliferation. Cells in the various phases of mitosis are rather frequently seen (Fig. 2, *g*). All transitional forms are found, from the long drawn out spindle cell to band formations. As a rule no sarcolema could be demonstrated except occasionally in the vicinity of the nucleus. Between the cylindrical cells are large giant cells (Fig. 3, *a*), round or polygonal cells with a vesicular nucleus, cells with eccentrically placed nucleus and deeply staining eosin protoplasm (Fig. 2, *e*). Irregular masses of chromatin occur throughout the growth (Fig. 2, *b*). Marchand calls attention to the glycogen content of these tumors. Unfortunately the fresh tissue was not examined for this substance, but as it is readily dissolved out, it is probable that the vacuoles referred to above are due to the loss of glycogen. No retrogressive metamorphosis is present, except on the surface of the excrescence in the uterine cavity, where some nuclear fragmentation and slight necrosis is found. Thin-walled cysts (Fig. 5) lined by a single layer of cuboidal cells are occasionally found. The growth is very vascular, the vessel walls being composed only of an endothelial coat. The nature of the reticulum is not clear. Sections from the uterine wall below the growth contain no tumor tissue

According to the usual nomenclature this growth would naturally be placed with the

rhabdo-myo-sarcomas, but for reasons previously stated we prefer the simple name of mixed tumor.

Mixed tumors of the uterine body, contrary to those of the cervix, are of infrequent occurrence. We found only eight authentic reported cases, including the one herein mentioned. The youngest patient was 40 years of age (Franqué). Menstruation had been irregular for four years. All the other women were past the menopause, their ages varying from 50 to 62 years. The clinical symptoms, without exception, were pelvic pain accompanied by a watery or bloody vaginal discharge which was fetid in some of the cases. The symptoms were of short duration, being from one to six months. A positive and correct diagnosis from currettage was not made. All the women had borne children. Franqué's patient had given birth to eleven, Penkert's to ten, Gebhard's had only three, but there had been eight or nine abortions; Hunziker's had two children, which was the smallest number reported. All the tumors sprang from the tubal region, except two, which developed in the posterior uterine wall. They were all single tumors, except Hunziker's, in which there was a hazelnut-size subperitoneal growth which he considered a metastasis. In Penkert's case the tumor, which was 7.7 cm. long and 6.5 cm. wide, sprang from a pedicle scarcely 1 cm. in diameter. In our case the tumor mass extended entirely through the uterine wall, however, it could readily be differentiated from the surrounding musculature. They usually fill the uterine cavity and present an irregular polypoid surface, with dark necrotic areas. They are of rather soft consistency and a grayish or yellowish white color. Microscopically besides sarcomatous tissue and the different forms of connective tissue, smooth and striated muscle, small cysts, cartilage, and tissue resembling carcinoma may be present. Metastases to other organs or involvement of regional lymph glands were not observed. One patient died of exhaustion seven days after total extirpation (Franqué). All of the remainder whose histories were followed after operation died from local recurrence within six months except Läwen's patient, who lived one year.

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THE NUTRITIONAL CHANGES OCCURRING IN FIBROMYOMA OF THE UTERUS INCIDENT TO PREGNANCY AND THE PUERPERIUM[1]

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BEFORE taking up for consideration the effect of pregnancy upon the nutritional changes of fibromyoma of the uterus, it is desirable to study briefly the life history of these neoplasms under ordinary or non-pregnant conditions.

Little is known regarding the etiology of fibromyoma of the uterus except that the growth of the neoplasm is associated with sexual maturity. The monthly engorgement of the uterine vascular system favors development, while the cessation of the menstrual function encourages degenerative changes. Fibromyoma rarely develops before puberty or after the menopause. Not only does the tumor cause sterility, but sterility favors the development of the neoplasm. After careful investigation of the subject, Kelly and Cullen (1) express the opinion "that the uterus must have something to do, and that if it is not kept relatively busy as a result of frequent pregnancies, it may tend to show its activity in another direction, namely in the formation of myomata."

The point of origin as well as the origin itself, of fibromyoma is a subject of dispute. Virchow (2) locates it in the smooth muscle tissue of the uterine wall. Others place the beginning of the growth in the blood-vessels of the uterus — the tortuous arterioles. Arteries supplying the growth usually show hyperplasia of the middle coat, often in a state of waxy degeneration.

Obliteration of the arteries is of common occurrence and lends strength to the theory that the main cause of the development of the neoplasm is endarteritis obliterans. Fibromyomata are composed essentially of the same structures as the uterus itself, viz.: muscular bundles and fibrous tissue.

The bundles of muscular fibres are formed into spherical lobes joined by connective tissue. This interlobular connective tissue forms a framework which binds the different lobes together and envelops the growth as a whole with a capsule of variable thickness. This capsule may be tightly adherent to the subjacent tumor or it may have a loose attachment. The lymphatic and blood currents circulate within the capsule and in the interlobular connective tissue. The vessels of the capsule proper give off secondary branches, these anastomose with other vessels and form interlobular networks — some branches penetrating the lobes. The center of each lobe receives a small blood supply compared with that of the peripheral portions of the neoplasm. As a rule, fibromyomata are not well vascularized.

The rapidity of the growth and the size of fibromyomata vary within wide limits. Tumors may cease to grow; may remain stationary; may decrease in size or disappear; may be cast off from the uterine attachment, or may undergo degenerative changes. Starting

[1] Mütter lecture. Read at College of Physicians and Surgeons, Philadelphia, December 10, 1909.

as interstitial tumors they may produce uniform enlargement of the uterus; or working to one or other surfaces they may become submucous or subperitoneal. The base of the attachment may become reduced to a small pedicle containing the nutrient artery. A case is mentioned by Kelly (3), which demonstrates the peculiar behavior of these tumors. In 1869, Dr. Washington Atlee examined a patient and made a diagram of a large interstitial fibroid. The uterus was then the size of a seven months' pregnancy, uniformly enlarged, and the uterine sound entered the cavity eight or nine inches. Twenty-five years later, Dr. Kelly operated and removed a fibroid weighing fifty-nine pounds attached by a narrow pedicle to a small uterus which had been crowded to the pelvic floor.

About two-thirds of all fibromyomata show non-malignant degenerative changes after the occurrence of the menopause. The frequent coexistence of fibrous changes with hyaline degeneration is attributable to faulty nutrition. Areas of hyaline degeneration sometimes liquefy and break down. If such liquefaction be extensive and accompanied by fusion of different foci, a large cyst will be formed with irregularly shaped wall. Again, hyaline degeneration may undergo fatty changes with extensive central necrosis.

Œdematous and cystic degenerations are considered the result of interference of the return circulation. Parts of the tumor or the whole tumor become soft and fluctuant owing to serous fluid imprisoned within enormously dilated lymph channels. The ultimate result may be the formation of a thin walled cyst traversed by fibrous bands which are the remains of obliterated blood-vessels. Œdema is frequently the forerunner of gangrene.

Myxomatous degeneration is allied to œdematous and is characterized by the effusion of mucous material between the muscular bundles and proliferation of round cells in the connective tissue.

Tumors devitalized on account of deficient blood supply, and which have already become the seat of some form of degeneration, are prone to undergo calcareous changes. The calcareous infiltration may begin in the center or in the periphery of the growth. Calcification is regarded as a conservative process by means of which a degenerated mass is converted into an innocuous body.

Necrotic changes are among the most frequent and dangerous complications of fibromyoma. Efforts at separation and expulsion of submucous growths are liable to be followed by sloughing of the tumor. A neoplasm undergoing necrotic changes may be infected by putrefactive germs. Micro-organisms may reach subperitoneal tumors by way of the intestinal tract. Diminished vitality of the tissues due to pressure or to adhesions of the bowel to the tumor favors the penetration of bacteria. The appendix may become adherent and produce suppuration or gangrene of the tumor. Interstitial tumors may be infected from the bowel or from the uterine mucosa. Infection by means of the circulation is brought about through the agency of septic emboli.

Pain is a marked symptom of the occurrence in some form of degeneration of the fibromyoma, having been met with, according to Noble (4) in two-thirds of the necrotic, three-fifths of the cystic, and one-third of the myxomatous degenerations.

This brief sketch of the life history of fibromyoma of the uterus is introduced to lead up to the consideration of another phase of the subject. It would seem *a priori*, that every line of investigation had been thoroughly studied. The etiology of the neoplasm; its frequency; its growth and degeneration; the anatomic varieties and pathology; complications; symptoms; diagnosis; prognosis; treatment, medical and surgical, have all been subjected to exhaustive research.

The pendulum of thought swung from the gynecologic to the obstetric viewpoint and led to investigations regarding the influence of fibromyoma of the uterus upon sterility and the various complications incident to pregnancy and labor. Abortion and premature labor; malpresentation of the infant; placenta prævia; and post-partum hæmorrhages, are some of the recognized complications. Dystocia, often demanding artificial and surgical methods of delivery, has received careful consideration. When to operate, how to operate, having in mind the interests of two lives, have been

questions of vital importance to gynecologic and obstetric surgeons.

It would seem indeed that every pertinent line of thought had been so thoroughly worked over that it was worn threadbare; yet one field of investigation has received but scant cultivation, and to that I direct your attention to-night. Withdraw consideration of the effect of the tumor upon pregnancy, labor, and the puerperium, and reverse the lever of thought to take up the study of the effect of pregnancy and the puerperium upon the tumor. This will lead to the recognition not only of nutritional changes in the fibromyoma, both physiologic and pathologic — dependent upon changes in the maternal organism as a result of pregnancy, but also to the occurrence of gangrene and suppuration — the dangers of which are greatly enhanced by the complication of pregnancy. The developmental and retrogressive changes of pregnancy and the puerperium respectively exert a marked influence upon the growth and decay of tumor life.

The subject will be presented from the standpoint of physiologic and pathologic study. The physiologic study includes changes observed in both the normal uterine structure and in the complicating fibromyoma.

PHYSIOLOGIC CHANGES IN THE NORMAL STRUCTURE OF THE PREGNANT UTERUS

The first appreciable alteration observed in the structure of the normal uterus as a result of impregnation is increased vascularity accompanied by increased growth. The progressive enlargement of the organ during the first half of gestation is due to hypertrophy and hyperplasia of the smooth muscular element. During the second half, distension of the uterus is an additional factor in promoting enlargement. The connective tissue between the muscular fibres is not only augmented by proliferation but is also thickened by serous infiltration. White cells in great numbers escape from the engorged blood-vessels and a nutritive energy is awakened which borders upon inflammatory action (5). The final result of this developmental activity is to build up tissue and increase the size of the organ enormously. The length of the virgin uterus is about 7 cm.; that of the full term gravid organ about 35 cm. The weight of the former is 43 grams; that of the latter about 1,000 grams. Equally striking as the constructive phenomena of pregnancy is the destructive of the puerperium. In five or six weeks after the expulsion of the full term product of gestation, retrograde changes affect the reduction of the uterus to almost its original size and weight. Nearly 1,000 grams of highly vitalized tissue is devitalized and eliminated. This process of involution consists of degenerative changes — granular and fatty — of the uterine structure. The albumen of the muscle cell is to a great extent converted into peptone and discharged with the urine. In addition to the process of involution permanent contraction and diminished blood supply act as factors in reducing the size of the uterus.

PHYSIOLOGIC CHANGES IN FIBROMYOMA COMPLICATING PREGNANCY

It has been for a long time and still is, a matter of common observation that pregnancy inaugurates certain changes in fibromyoma of the uterus. The tumor increases in size; it changes position; it undergoes alterations of shape and consistency during pregnancy, while it diminishes rapidly in volume and may disappear during the puerperium. Being composed of the same histologic elements as the normal uterine structure it participates in the same physiologic changes that occur in that organ during gestation — nutritional growth of the muscular and connective tissue elements with serous infiltration of the latter. The muscular fibres are hypertrophied, multiply themselves, and the process does not go on without a certain degree of inflammation which is accompanied by an aggregation of white cells in the intermuscular spaces.(5) Although the uterine structures proper of the gravid uterus are engorged with blood a complicating fibromyoma receives an insufficient blood supply. The nutrient vessels do not enlarge, as a rule, to any appreciable extent; they are surrounded by thick fibrous walls and are deprived of the elastic coat. The hyperplastic middle coat is frequently found in a state of waxy degeneration. Changes in the arteries may exist to the extent of obliter-

ation. The primary capsular network of blood-vessels exhibits increased vascularity while the deeper lobes of the tumor will be found deprived of blood to the degree of exsanguination. The result is degeneration of a large number of muscular bundles and the absence of red globules in some of the arterioles.

The increase in volume of the neoplasm during pregnancy is not so much due to hypertrophy and hyperplasia of the muscular fibres as to rapid proliferation of the fibrous element and especially to serous infiltration or œdema. Gusserow first demonstrated that a true growth of the tumor is relatively rare and that the occasional enormously large increase in size is due to the increased amount of fluids in the tissue. Owing to this increased fluidity the consistency of the tumor will naturally decrease and we find those growths which take on a rapid increase of volume are soft and apparently fluctuating. This softening is nearly always due to serous infiltration of the connective tissue and rarely to myxomatous or cystic degenerations (6).

The actual increase of the muscular element is witnessed principally in the interstitial type of fibromyoma except, as pointed out by Arnheim (7), in those interstitial growths which are encapsulated by a firm, rigid, and poorly vascularized capsule. The more intimate the union of the growth, with the uterus, the more it will partake of these physiologic processes, and the closer the structure of the tumor approaches to that of the organ the more pronounced will be the changes.

The influence exerted by the physiologic changes of pregnancy is observed not only in the increased growth of the tumor and its softer consistency, but also in the alteration of its shape. The general tendency of the neoplasm is to adapt itself to the growth of the uterus and to become flattened and elongated. Olshausen(8) has recently called attention to the flattening of the tumor during pregnancy. A tumor that had presented all the appearances of a globular growth will apparently disappear by pressure of the increased volume of the uterus forcing the neoplasm to assume a flattened shape difficult to recognize. After birth the tumor quickly resumes its original shape.

This beneficent alteration of the form and position of the tumor is demonstrated most strikingly and most happily in those growths situated within the true pelvis. Tumors which had blocked the true pelvis during the early months of gestation and which had threatened to become incarcerated below the promontory of the pelvis, and which apparently had presented an insurmountable obstacle to delivery *per vias naturales* have softened, flattened, and elongated. The rising of the gravid uterus into the abdominal cavity aided by the changes of shape and consistency of the neoplasm; by the intermittent painless contraction of the uterus, and later by true labor pains, carries with it the growth which is eventually lifted above the superior strait. Lusk (9) and Jewett (10), in their respective text-books of obstetrics, describe a physiologic rearrangement of the muscular fibres during pregnancy and labor by which they are drawn up from the lower passive segment of the uterus to the upper active portion. If this be correct the change will assist materially in the elevation of the tumor.

Involution of the fibromyoma takes place during the puerperium as well as involution of the uterus. Enormous growth during pregnancy is followed by equally striking decrease in size of the neoplasm. The shape changes again to assume that which existed before the advent of gestational growth; the location of the tumor alters to its original position; the structure hardens. The hardening is the combined result of absorption of the serous infiltration of the tumor; the contraction of the organ, and the diminished vascularity. Exaggerated degrees of such changes may lead to absolute disappearance of the growth.

PATHOLOGIC CHANGES IN FIBROMYOMA COMPLICATING PREGNANCY

In the brief reference already made to the life history of fibromyoma of the uterus it is recognized that in conditions outside of the influence of pregnancy, the neoplasm is subject to various pathologic changes, and frequent as are those changes ordinarily the occurrence of pregnancy in a fibromyomatous uterus imparts extra liabilities, Nutritional effects leading up to necrosis and suppuration have

been recognized by pathologists and surgeons, but little consideration has been bestowed upon the subject from the standpoint of the coexistence of pregnancy. It is only in recent literature that one can find mention of it as an obstetric complication. Particularly worthy of notice is the inaugural thesis of M. George Berger, published at Paris in 1907. He has collected the reports of twenty-three cases of suppuration of fibromyomata in pregnant or puerperal uteri and made them the basis of careful study.

During pregnancy the poor vascularization of the neoplasm is further impaired by arteriosclerosis, waxy degeneration, and thrombosis of the blood-vessels. Marked exsanguination may terminate in gangrene, while œdematous and cystic changes may result from interference with the return circulation. Red degeneration of fibromyoma has been met with under other conditions but the best examples are observed in tumors associated with pregnancy. Bland-Sutton (11) has witnessed during the course of gestation the complicating fibromyoma assume a deep red or mahogany tint. In the early stages the color is observed in streaks, but as gestation advances the alteration of color permeates the whole tumor. Occasionally, even in the mid-period of pregnancy, this necrotic change may be so extreme that the central part of the neoplasm is reduced to a red pulp. The red color is not caused by increase of the muscular elements of the fibromyoma but to blood pigment diffused through the necrotic tissues of the tumor. Pain and tenderness are marked clinical features of red degeneration of fibromyoma complicating pregnancy. Complications arising during the course of pregnancy associated with fibromyoma of the uterus may be accidental as well as nutritional. They may originate from mechanical causes as when incarceration of the growth within the true pelvis is followed by pressure effect and necrosis of the tumor or of the surrounding soft parts.

Torsion of the pedicle may produce hæmorrhage within the fibromyoma leading to the formation of cystic spaces. Fatty degeneration, suppuration, and softening, with central necrosis and sudden disturbance of nutrition follows. Accompanying these changes will be stasis of the lymphatic circulation with dilatation of the lymph channels. Gradual mechanical atrophy of the tissues combined with diminished nutrition frequently leads to fatty degeneration (5). Torsion of the pedicle of a fibromyoma may also cause intraperitoneal hæmorrhage and collapse. Acute abdominal pains added to the clinical picture would simulate closely the symptoms of ruptured ectopic gestation (12). Increased vascularity of the surface of a subperitoneal fibromyoma may lead to a rupture of a superficial vein and fatal intraperitoneal hæmorrhage (13).

Schenk (14) removed a fibromyoma at the fifth month of uterogestation on account of severe symptoms, and found the growth degenerated in various parts. In his opinion the rapid growth of the neoplasm during pregnancy had caused a stretching of the capsule and diminished blood supply to the tumor.

J. D. Malcolm (15) removed a fibroid uterus seven weeks after premature labor and found a grayish white slough within the central portion. The condition he said was unique. It did not seem to be the ordinary sloughing due to infection from the uterine mucosa. The growth was so close to the uterine cavity that contamination from that source would inevitably have induced an ordinary putrid slough of the whole tumor and death of the patient, as the neoplasm extended as near to the peritoneum as to the mucous surface. The large number of muscle cells and greater contractility of the outer portion of the growth suggested that the central part had been subjected to considerable pressure, and that this, together with the diminution of the vascular supply caused by the involution of the uterus, afforded the most satisfactory explanation of the sloughing of the central part of the growth. According to this view the slough was aseptic and it is possible the dead tissue might have been slowly absorbed.

Nussbaum (16) claims that the irritation of fibromyomata causes inflammatory processes of the decidua and placenta which is manifested by increased secretion. A true hydrorrhœa gravidarum may result. Proliferation of chorionic villi with small warty or polyp-like excrescences produces intimate adhesions of the placenta with submucous fibromyomata.

He has experienced great difficulty in removal of the placenta and this is one of the chief causes of adherent placenta and retention of debris with attendant hæmorrhage after childbirth. He points out that putrefaction of these growths is especially liable to take place when manual detachment of the placenta is necessary, even under strict aseptic precautions.

Central hæmorrhage may result from torsion of the tumor or of the pedicle and from physiologic flattening and change of shape of the neoplasm. But undoubtedly the most common cause of hæmorrhage within the fibromyoma is uterine contraction. Gusserow doubts whether extravasations of blood take place before birth. Schültz (17) reported a case of total necrosis of an intramural fibromyoma caused by rupture ot the nutrient blood-vessels during contractions of the uterus in the course of a miscarriage. Krugenberg (18) met with a case of sloughing and suppuration of an interstitial fibromyoma at the fourth month of gestation attributable to hæmorrhage between the neoplasm and its capsule brought on by the act of defecation.

Suppuration of fibromyoma may occur in the central or deeper lobules of the tumor or in the periphery directly beneath the capsule.

1. *Beginning in the center of the tumor.* The diminished blood supply and low degree of vitality of the deeper lobes are so marked that nothing but the existence of an aseptic field prevents suppuration. If the tissue be invaded by pathogenic microbes an excellent culture medium exists without phagocytic protection. The tissues break down into circumscribed purulent collections the pus appearing in the middle of necrotic cavities. The walls of the pus collections are formed by tissues possessing greater power of resistance. The limit of the dead and living structure is marked by an inflammatory zone with numerous phagocytes. Deep seated suppuration may involve any part of the tumor or one or more of its lobes. In some cases the suppuration is not circumscribed.

2. *Suppuration under the capsule.* The periphery of the fibromyoma, that portion in contact with the capsule, receives a more liberal blood supply and is therefore composed of vigorous tissue capable of offering resistance to pathogenic germs. The capsule itself being composed of dense fibrous tissue also combats the action of pus producing organisms. Suppuration of the loose cellular tissue separating the fibromyoma from the capsule tends to the formation of a liquid around the tumor in which it is bathed and which isolates the growth from the surrounding substance. The pus may be confined within the tumor, giving rise to augmentation in size of the growth and of the uterus; it may escape by rupture of the cyst wall into the peritoneal cavity, or it may discharge into the uterus and escape per vaginum.

Olshausen (7) reported a case in which the capsule of the tumor suppurated, broke through the broad ligament and later, under the influence of labor pains, ruptured into the abdominal cavity causing fatal peritonitis.

Adhesion of the tumor to the abdominal wall may permit escape of the abscess contents externally. Neugebauer (19) reported a case in which three months after the birth of the fifth infant a fibromyoma suppurated and opened spontaneously upon the surface below the umbilicus. By discharge and curettage through the artificial opening about twenty-five ounces of debris were removed during a period of six months. Suppuration ceased and the wound healed.

Suppuration follows abortion, miscarriage, premature and full term labor. On the other hand, the process may excite uterine contraction and be the cause of the expulsion of the product of conception at any period of utero-gestation.

Infection of fibromyoma is the most common cause of suppuration. Contributing factors, diminishing the power of resistance to invasion and action of germs, are the low vitality of the neoplasm, deficient blood supply of the deeper parts, degenerative changes, and extravasations of blood within the growth.

Streptococcus, staphylococcus, and gonococcus prove active agents of infection.

Gatti (20) reported two cases of suppuration of the central portions of fibroid tumors of the uterus in which bacteriologic examinations of the pus revealed the staphylococcus. Hartman and Mignot (21) recovered a special anærobic bacillus. The source of infection has

been attributed by some writers to the general circulation, but others have contended that this is impossible except by means of septic emboli.

Adhesion of the bowel or of the diseased appendix to the tumor may bring about infection of the growth from the intestinal tract. Suppuration of the uterine appendages is able to furnish the source of pathogenic germs.

In the vast majority of cases the location of entrance of pathogenic germs is the uterine mucosa. The frequency with which labor occurring in women with fibroid tumors of the uterus is complicated by malpresentations, placenta prævia, etc., renders them more liable to infection. Dystocia is often met with in these cases involving the necessity for artificial aid, forceps, or version, and such interference is a well recognized factor of infection. Pathogenic organisms producing septic endometritis are conveyed to the fibromyoma by way of the lymphatic circulation. Septic phlebitis may implicate the neoplasm through the blood-vessels. Other conditions contributing to suppuration have been referred to in the alteration of the blood supply; degenerations and hæmorrhages into the tumor resulting from uterine contraction.

Abortion and miscarriage are frequently incomplete when occurring in the fibromymatous uterus, and the retained fragments of placental tissue or membranes add to the liability of infection.

Symptoms of suppuration in fibromyoma of the uterus during and after the termination of pregnancy are manifested by increase in volume of the tumor, abdominal pains, fever, accelerated pulse, vomiting, and diarrhœa.

The pain is localized in the tumor; it is of variable intensity, ceasing at intervals and at other times being acute. The intensity of the pains depends upon the degree of peritoneal involvement. Sudden and severe pain with symptoms of collapse is indicative of acute peritonitis. Pain of moderate degree relieved by recumbency would suggest deep seated suppuration, when accompanied by septic symptoms. Fever of variable severity is nearly always present. It may assume a typhoid type, or it may be erratic with exacerbations preceded or not by chilly sensations or rigors. When peritoneal reaction is slight, producing adhesions, it is said that the temperature is irregular. No temperature rise is claimed to exist when a purulent collection has succeeded to aseptic necrosis.

Bearing upon the subject of suppuration of fibromyoma during pregnancy and the puerperium, the following cases have come under my observation and have not been reported previously.

CASE I. Suppuration and gangrene of fibromyoma. Death 40 days after childbirth. Mrs. B., American, aged 26 years, first came under my observation during the summer of 1904. She was advanced about midway in her first pregnancy, but the uterine development had reached already the proportions of a seven months' gestation. Examination revealed a large interstitial fibromyoma complicating the pregnancy. The neoplasm involved the corpus and fundus of the organ producing uniform enlargement. The woman was anxious to have an infant and also to be rid of the growth. Instead of subjecting her to two risks, first, that of childbirth; and second, the removal of the tumor by a subsequent operation, it was decided to permit pregnancy to advance as near full term as possible and then perform a Porro-Cæsarean section.

On the evening of September 14, 1904, about two weeks before the anticipated time, labor set in briskly and the patient was brought to my private hospital at 9 P. M. with the dilatation of the os well advanced. The uterine contractions were strong and recurred at short intervals. Labor was progressing normally and rapidly; in consequence of which I decided unfortunately to change the treatment outlined and permitted the birth to terminate naturally. The birth of the infant at 4.10 A. M. September 15th, was followed by a post-partum hæmorrhage. An intra-uterine irrigation of hot sterile water having failed to control the bleeding, the uterine cavity was tamponed with sterile gauze. At 8 A. M. the same morning the pulse rate was 120 and the temperature 99, that evening, 130, and 98.6, respectively. September 16th, A. M., pulse 120; temperature 97.4; P. M., pulse 140; temperature 103.6.

For the following ten days the temperature fluctuated between 99 and 103.4; the pulse between 130 and 140. At noon September 25th, a severe chill was followed by rise of temperature to 105; and on the 26th, another chill with elevation of temperature to 105.6. A septic temperature continued from this time until death on October 25th, a period of forty days. The uterine mass did not undergo reduction of size from the process of involution, but remained large and was sensitive. September 27th, 28th, and 29th, severe pain was complained of in the abdomen extending down the right leg. Other symptoms were nausea, vomiting, and diarrhœa.

The treatment consisted of vaginal and intra-uterine douches; nutritious diet, principally in liquid form; and such supporting remedies as strychnine, quinine, digitalis, whiskey, and champagne.

The autopsy revealed a fibromyoma with a large

Suppuration and gangrene of fibromyoma. Death 40 days after childbirth.

abscess cavity having gangrenous wall and contents. The abscess had ruptured at the fundus of the uterus and finger-like projections extended from it into the peritoneal cavity. There was a general peritonitis with purulent, dirty looking effusion.

One would naturally infer from the history of the case that suppuration of the fibromyoma was caused by infection of the uterine mucosa. The treatment employed for post-partum hæmorrhage, the intra-uterine douche, and gauze tamponade would support such an opinion; on the other hand, the early appearance of symptoms of sepsis with a temperature of 103.6 on the second day of the puerperium might signify that suppuration had preceded and caused the premature labor.

The usual treatment for septic endometritis was promptly instituted but failure to influence the progress of the disease soon led to the suspicion of suppuration within the fibromyoma. Supravaginal hysterectomy was naturally suggested as the method of procedure to save the life of the patient, but her desperate condition from the outset warned me that she could not survive the shock of operation. Dr. I. S. Stone of Washington visited the patient in consultation and agreed that her life would be shortened by such interference; nevertheless I have ever since regretted that I did not take the risk.

CASE 2. Suppurating fibromyoma during puerperium. Supravaginal hysterectomy. This case occurred at Garfield Memorial Hospital, but unfortunately the record has been lost. The patient, a colored woman, was transferred from the obstetric to the gynecologic service. Her infant had been born about two weeks. The fundus of the uterus extended above the umbilicus; the mass was sensitive; the patient presented septic symptoms. Diagnosis, suppurating fibromyoma. Operation, supravaginal hysterectomy. Recovery. On section, the central part of the tumor contained a large abscess which communicated with the uterine cavity by an ulcerated opening 2 x 1 cm.

CASE 3. Sloughing submucous fibromyoma at the seventh month of pregnancy. Foul discharge. Premature labor. Recovery. Mrs. B., white, aged 2[illegible] years; had been married ten years; mother of three children. March 14, 1909, she gave birth to a premature infant at the seventh month. For one week before labor she had had fever and passed a foul smelling discharge per vaginam. I saw her in consultation

with Dr. R. C. Ruedy on March 17th, three days after birth of the infant. Her pulse was very rapid (130 to 140) and she had fever and nausea. Vaginal examination. The cervical canal was dilated and passing the middle finger through to the uterine cavity, a sloughing mass could be felt at the fundus. The placenta had been expelled naturally.

Diagnosis: septic fever; soughing submucous fibroid. The critical condition of the patient contraindicated surgical interference. Antiseptic intra-uterine douches and general supporting treatment was followed by improvement and gradual restoration to health.

In the twenty-three cases of suppuration of fibromyoma collected by M. G. Berger (22), one of them is not clearly associated with pregnancy (case 6). Abortion or miscarriage occurred nine times (cases 3, 5, 7, 9, 12, 15, 16, 18, 21). In the majority of the cases suppuration followed the termination of uterogestation, spontaneous as well as artificial. Septic symptoms (rapid pulse, fever and diarrhœa)were noticeable before or soon after the abortion. In one case (21) the suppuration and septic symptoms began one month after conception and continued until four and a half months of gestation. The patient died of peritonitis on the ninth day after miscarriage. The tumor contained three liters of pus. In the third case of the series, sepsis developed four months after miscarriage. Two and a half liters of pus were removed by tapping the tumor; hysterectomy was afterwards performed and the patient recovered. In two cases (5, 7) after curettage had failed to relieve the symptoms, hysterectomy was performed successfully.

Three of the nine cases recovered and six died. The recoveries were all cases upon whom hysterectomy had been performed (3, 5, 7). In the six fatal cases no operation had been performed except that in one the uterus had been emptied.

Thirteen of the twenty-two cases followed premature or full term labors, with three recoveries and ten deaths.

In the three cases that recovered, one opened spontaneously and discharged pus through the abdominal wall (case 1); one discharged pus *per vaginum* for twelve days at the fifth month of pregnancy, was delivered artificially at the eighth month, and made a good recovery with disappearance of the fibromyoma (case 2); one had pain, vomiting, and diarrhœa for one month after childbirth. The necrotic

Suppuration of fibromyoma during puerperium. Supravaginal hysterectomy. Recovery.

and suppurating tumor was opened and drained successfully (case 4).

The fatal cases presented difficult labors, and the frightful mortality when treated by delivery through the natural passages emphasizes the importance of early Porro-Cæsarean section. Cases of suppuration of fibromyoma after childbirth should be treated by prompt performance of supravaginal hysterectomy. A valuable lesson is taught in these cases by the disastrous result of delay and attempts to deliver by obstetric methods.

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THE RELATIONSHIP BETWEEN THE THYROID AND PARATHYROIDS[1]

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SINCE the re-discovery of the parathyroid glandules by Gley (1) in 1893, great interest has been taken in these organs. This interest was confined largely to physiologists and pathologists for a decade or more, but more recently it has been shared by surgeons and the references to these glandules are becoming very numerous. Escherich (2) claims that tetanoid conditions in children receive their explanation from a study of the pathology of the parathyroid glandules. In his clinic in 89 infants in an unselected series the parathyroid bodies were injured by hæmorrhage in 39 cases and the severity of the clinical symptoms was in direct proportion to the severity of the pathological changes in the parathyroids. He thinks the hæmorrhage probably occurs as the result of trauma at the time of birth. Berkeley (3), Lundborg (4), and Frommer (5) claim therapeutic benefit from the administration of an extract of the glandules in cases of paralysis agitans.

Schirmer (6), after an extensive review of the literature, says the logical conclusion is that the function of these glandules is a toxin neutralizing one. On this basis he proposes to treat defective functioning by a specific antitoxin. Working on these lines, Leischner (7) transplanted the parathyroids in rats to overcome tetany in parathyroidectomized animals. Edmunds (8), Vassale (9), Lusena (10), and MacCallum and Davidson (11) also report varying degrees of success, where parathyroid was administered to animals suffering from tetany following parathyroidectomy. The method of administration was by the mouth or by injecting an emulsion subcutaneously or intravenously. The last named authors administered to a dog the parathyroids of 112 dogs and several cows in 15 days and failed eventually for want of a supply. Berkeley and Bebe (12) recently reported having separated the protein of the gland into three parts called nucleo-protein, globulin, and albumin. The former, they claim is equal to the whole gland, the other two being useless in relieving tetany. From the use of the nucleoprotein they claim success in ninety-five per cent of the trials in experimentally induced tetany in dogs. In the case of the human subject, Pool (13) reports a case of tetany following thyroidectomy where beneficial results are said to have followed the administration of parathyroid extract.

The operation for goiter is now being carried out with a view to avoiding injury to the parathyroid glandules. Halsted and Evans (14) made a very careful study of the blood supply of these glandules and described a method of operation whereby the glandules are not disturbed; Geis (15) has reported similar work, and coming to the practical application in his article says, "I believe that, with a proper operation and careful dissection, the whole

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thyroid gland can be removed without causing tetany. The essential thing in the operation is to recognize the parathyroid glands and their blood-vessels. Neither of these must be injured." This would imply that he regards ablation of the whole thyroid as being a safe procedure, the only anxiety being that of saving the parathyroid glandules intact.

These and many other attempts at making a practical application of the facts available regarding the parathyroid glandules induced the present writer to undertake a series of experiments with the object of confirming or otherwise the statements of the several authors as to the functional importance of the parathyroid glandules and their physiological relation to the thyroid gland.

The views at present most widely accepted as regards the effect of removal of the thyroid and parathyroid glands are, I think, fairly stated thus: Parathyroidectomy is invariably and rapidly fatal; thyroparathyroidectomy is less rapidly fatal than is ablation of the parathyroid glandules alone. Kocher (16), Lusena (10), Vassale and Generali (17), and MacCallum and Davidson (11). Thyroidectomy alone in, probably all vertebrates, Jeandelize (18). is followed by a series of chronic nutritional changes when the behavior of the animal is altered and sluggish, the skin becomes thick and œdematous, the hair becomes coarse and falls out and in young animals growth is interfered with so that the animal remains stunted; and finally that, though these two organs are functionally associated with one another, neither one can assume the functions of the other, and that under no circumstances does the histological structure of the one approach that of the other. Thus it is seen that the parathyroid glandule is generally regarded as having a more vital function than the thyroid gland.

This effort at making a practical application of our present knowledge of the relation between these two sets of glands is to be commended, particularly such work as that of Halsted and Evans. From the results I obtained in this series, however, some of the foregoing statements regarding the relative importance of the two organs cannot be confirmed, and some of the practical conclusions referred to seem premature and unwarranted.

In this series, twelve cats, twenty-five dogs, and twenty-five rabbits were operated on. In these animals the operation of parathyroidectomy without very severe injury to the thyroid gland is very frequently impossible, owing to the internal parathyroid glandules being so deeply imbedded in the substance of the thyroid; and conversely, a thyroidectomy is still oftener an impossible operation if the parathyroid glandules are to be left intact. From a study of the literature, one is not led to look for this difficulty. Welsh (19) and Vincent and Jolly (20) are amongst the few who mention the surgical difficulty in some cases and the impossibility in others. In twelve cats I was unable to perform a thyroidectomy more than once leaving even one parathyroid uninjured, and in 25 dogs this was possible only once (dog 4) where two parathyroids were preserved with blood supply intact. In rabbits it is usually an easy matter to preserve the two external parathyroids, but. it is very difficult to remove all shreds of the thyroid, as in fully one-third of the cases, the recurrent laryngeal nerve passes through the gland on one or both sides, and it is indeed quite a difficult surgical procedure to remove all shreds of the thyroid without injury to the nerve.

Removal of all the parathyroids, allowing the whole thyroid to remain, is also a difficult procedure. In the twelve cats I was able to do this only once, and in twenty-five dogs six times. In only one rabbit out of twenty-five (rabbit 10) was it possible to perform a parathyroidectomy, and in that instance on one side only; on the other side the lobe of the thyroid had to be removed to secure the internal parathyroid.

I have been unable to confirm the statement that complete parathyroidectomy invariably proves fatal, and that in a short time. In dogs 3 and 7, where serial sections of the thyroid removed post-mortem showed no parathyroid, the animals lived 30 and 27 days respectively without symptoms, and were killed. In dog 1, symptoms did not occur, and at the post-mortem no parathyroids were found, although serial sections were not cut. In cats 1, 6, and 8,in which at the operation the thyroid lobe with

the parathyroids on one side, and the parathyroids alone on the other side, were removed, the animals lived, without symptoms, 23 days, 25 days, and 30 days respectively, and were then killed. In all three cases a careful postmortem search was made, and the remaining lobe of the thyroid was cut in serial sections, and no traces of parathyroid was found. There is a tendency to disregard these exceptions—MacCallum and Davidson (11), Berkeley and Beebe (12)—and explain them by supposing that parathyroids have remained behind unobserved. All I can say is that the most careful search was made, and serial sections of the remaining thyroid lobe or lobes prove conclusively that no parathyroids were left in these lobes. Whether or not any accessory glandules were present in the thorax or some other part of the body, I am unable to say. Moreover, as Vincent (21) observes, "If accessory glands be so usually present, then the question as to the importance to life of these glands ceases to have the value hitherto attached to it."

Again, I have not been able to confirm another generally accepted statement, viz.: that parathyroidectomy alone is a more rapidly fatal operation than thyro-parathyroidectomy. In my experiments, death occurred earlier on the average with the complete operation than with parathyroidectomy. In cat 3, where a complete operation was carried out, death supervened in 30 hours; in cat 10, during the fourth day, and in cat 7, early in the fifth day. In those experiments, on the other hand, where a parathyroidectomy was performed, the following results were obtained: In cat 4 death occurred on the fifth day, but cats 1 and 6 were killed on the 23d and 35th days respectively and no parathyroid tissue was found when serial sections were cut.

In those rabbits submitted to the complete operation, one death supervened in 32 hours (rabbit 20), one in 43 hours (rabbit 21), two during the second day (rabbits 11 and 12), and one on the third day (rabbit 18).

Since in only one case (rabbit 11) was simple parathyroidectomy possible, this operation cannot well be compared with the complete operation in this animal, but in the case of the dog, in my hands, only one animal (dog 4) out of eight in which all parathyroids have presumably been removed, died of tetany and that on the 23d day. In two of the remaining seven (dogs 3 and 7) serial sections revealed no parathyroids left at operation.

Horsley (22) was the first to report operative myxœdema in experimental work, having observed it in the monkey. Murray (23) and Edmunds (24) later agreed with him on this point. Vincent and Jolly (20) were unable to confirm these findings after 13 complete extirpations on monkeys. This is similar to the report of Munk (25) and Kishi (26). In my series of experiments I have been unable to produce myxœdema in the dog, cat, or rabbit.

In dog 5, after thyroidectomy, the animal lived in apparently normal health, and on the eighty-third day the two parathyroids which were allowed to remain at the first operation, were removed, and the animal lived till the one hundred and twenty-seventh day. Up to the one hundred and fifth day no symptoms developed; from that time the animal suffered from sore eyes, a running nose, general weakness and loss of flesh, and died on the one hundred and twenty-seventh day. There was no increase of fat in the subcutaneous tissue, the hair did not fall out, the skin was not more waxy and dry. Neither were any of these symptoms observed in rabbits 16 and 18, which lived 86 and 82 days respectively, without symptoms, and were killed.

The majority of physiologists and pathologists hold to the view that the thyroid and parathyroid are two separate and independent organs, and that this independence is both anatomical and physiological. Recently, however, views very like those held by some of the earlier observers have been revived by Kishi (26), Vincent and Jolly (20), and Forsyth (34). These observers, without denying the possibility of a certain degree of functional independence, belonging to thyroid and parathyroid respectively, are nevertheless strongly of the opinion that there is a definite physiological relationship, and that in many ways they may be looked upon as constituting a single piece of apparatus.

This view is also strongly supported by a histological study of the thyroid and parathy-

roid and by changes in the latter which occur after removal of the former. Thus Vincent and Jolly found that in the cat a parathyroid left behind after thyroidectomy, changed its structure so as to approximate to that of the thyroid. In the dog, Mrs. Thompson and myself (27) have recently reported similar but more marked changes in a parathyroid of a dog left behind after removal of the thyroid (see Figs. 1 and 2), and I have to report a quite recent case of the same phenomenon in the rabbit (rabbit 19).

In this case, in which an attempt was made to extirpate thyroid and parathyroid in toto, the animal survived 45 days without symptoms and was then killed, but at the post-mortem

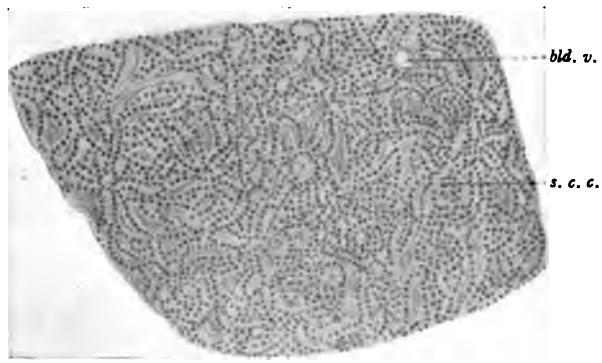

Fig. 2. Normal parathyroid of dog. ×120. *s.c.c*, Solid columns of cells. *bld. v*, Blood-vessel. To be compared with Fig. 1. (Halpenny and Thompson, Anat. Anzig., band 1909.)

Fig. 1. Parathyroid of dog, eighty-three days after thyroidectomy, showing vesicles, some of which contain colloid. ×120. *c*, Colloid. *e. interves*, Intervesicular epithelial tissue. *ves*, Vesicle. *c. ves*, Colloid vesicle. *e. ves*, Epithelium lining to vesicles. (Halpenny and Thompson, Anat. Anzig., band 1909.)

examination shreds of glandular looking tissue were found in the former situation of the external parathyroid and these, on microscopical examination, showed distinctly the first stages of transformation into thyroid tissue. Nearly all the portions of parathyroid tissue revealed minute cleft-like spaces. In other portions of the tissue small rounded spaces lined by a regular circle of cells were to be seen, and in still other regions, especially at the edge of the parathyroid, were typical, large colloid vesicles. In another rabbit (rabbit 15), which died forty-three days after removal of the thyroid, with both external parathyroids left in situ, no changes had occurred in these glandules. In rabbit 16, which lived 86 days with both external parathyroids left in situ, no symptoms occurred, the animal was killed, and no changes were found in the parathyroids, either macroscopically or microscopically. This was the result also in rabbit 19, living 82 days with only one parathyroid. There were no symptoms of myxœdema in any of these animals. Thus it will be seen that the results are not uniform, and one cannot account for this variation. It would seem, however, that under certain conditions yet unknown, the parathyroid changes in structure so that it ap-

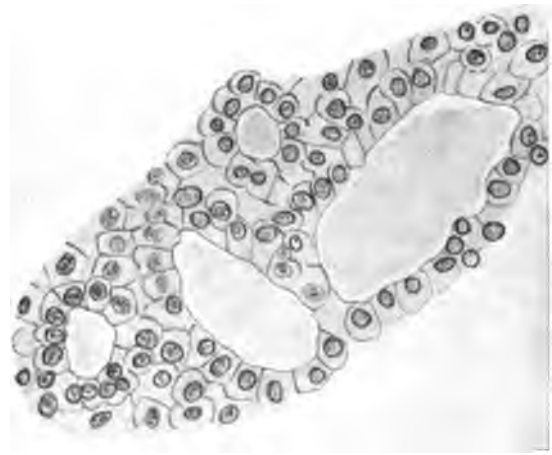

Fig. 3. Pituitary, pars intermedia. Dog after parathyroidectomy. Flemming. From H. and E. camera lucida × 350.

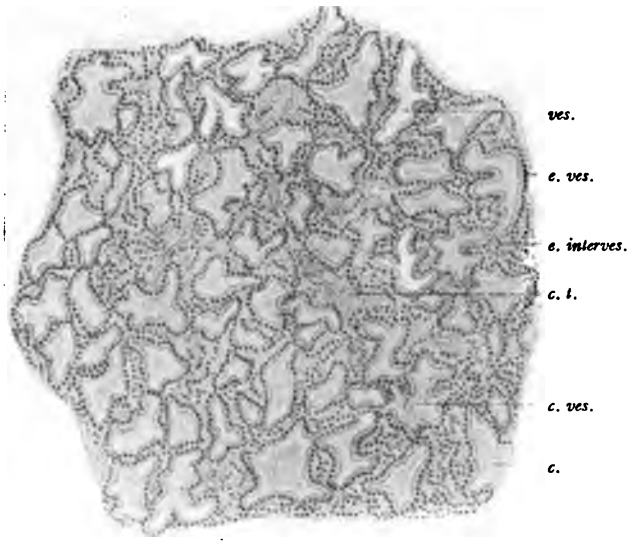

Fig. 4. Thyroid of dog, thirty-two days after removal of all four parathyroids. The vesicles have become very irregular in shape and there seems to be an increase in the intervesicular epithelial tissue. × 120. *ves*, Vesicle. *e. ves*, Epithelium lining vesicles. *e. interves*, Intervesicular epithelial tissue. *c. t*, Connective tissue. *c. ves*, Colloid vesicle. *c*, Colloid. Compare with Fig. 5. (Halpenny and Thompson, Anat. Anzig., band 1909.)

proximates very closely in structure to that of the thyroid.

In animals dead after parathyroidectomy Vassale and Donaggio (28) describe changes in the spinal cord. They say "Zones of degeneration in the lateral and posterior columns may be seen with the naked eye, but better after staining with nigrosin." I have been unable to confirm this. (See protocols, dog 4.)

Changes in the pituitary body have been described by Herring (29), occurring in two rabbits after thyroidectomy. In the anterior lobe there was no change. "Remarkable changes are at once apparent in the posterior lobe, and particularly that portion of it which lies next to the pars intermedia, masses of a colloid nature lie among the cells and fibers of the pars nervosa. In the neck of the posterior lobe, the colloid is even more plentiful." Rogowitsch (30) in 1889 had already stated that the pituitary acts vicariously for the thyroid. Other observers (31, 32, and 33) have noted the same phenomenon consequent on disease or removal of the thyroid.

In dog 4 of my series, where all parathyroids were removed, similar changes occurred, with the slight difference that in Herring's cases the colloid was found partly in the pars intermedia. The essential point, however, is that in his case of thyroidectomy, and in my case of parathyroidectomy, very similar changes occurred in the pituitary body.

There is a marked increase in the normal amount of colloid found in the pituitary (see Fig. 3) with a somewhat regular formation of the containing vesicle, which has a distinct layer of lining cells. This, to my mind, is distinct evidence of a close relationship between the thyroid and parathyroid and that their functions are similar. not antagonistic or corrective of one another. In conclusion I submit that many instances occur where a presumably complete parathyroidectomy is not followed by tetany, and that parathyroidectomy is not more fatal than thyro-parathyroidectomy. Evidence has been given to show that the histological structure of the thyroid after parathyroidectomy is very similar to the structure of parathyroid following thyroidectomy. The changes occurring in the pituitary body following thyroidectomy resemble those succeeding parathyroidectomy. This all seems to

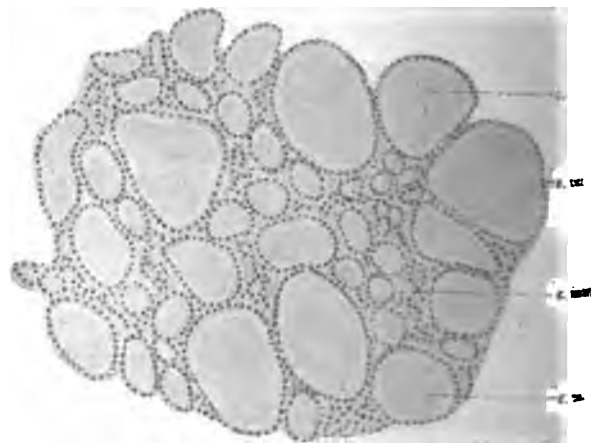

Fig. 5. Normal thyroid of a dog, for comparison with Fig. 3. *c*, Colloid. *e. ves*, Epithelium lining vesicles. *e. interves*, Epithelial intervesicular tissue. *c. ves*, Colloid vesicle. × 120. (Halpenny and Thompson, Anat. Anzig., band 1909.)

point strongly toward some very close relation between these two glands, and that in some instances at least, each is able to assume the functions of the other to a greater or less extent.

Though the parathyroid glands are not rudimentary thyroids, the whole apparatus is essentially one. Its function has to do with metabolism, and the acute symptoms, as well as the chronic when they occur, are due to a lesion sufficiently severe to impair its integrity.

PROTOCOLS

Dog 1. Four parathyroids and a doubtful body removed. Lived in perfect health, killed on 23d day. At post-mortem the thyroid lobes were removed and serial sections cut. No parathyroids were found.

Dog 2. Five parathyroids removed. Lived 31 days with no symptoms. Killed. Thyroid normal. Serial sections cut. One parathyroid found in the substance of the thyroid.

Dog 3. Four parathyroids removed and verified by the miscrocope as having their capsules complete. Lived 30 days without symptoms. Killed. Thyroid removed and serial sections cut. No parathyroids were found.

Dog 4. Three parathyroids seen on each side and removed. For two days seemed well. On the third day was ill, the hind legs were stiff. On the fifth day started attacks of tetany, commencing with a cough. Marked irritation of the nose. Drank with great difficulty. On the seventh day had coryza and the cough was worse. Tetany came on at intervals during the day. In the evening was moved to a hot room and nearly succumbed to attack of tetany. The respirations reached 275 per minute and the pulse was uncountable. In about five minutes animal became easier, and respirations dropped to eight or ten per minute. Moved to a cool room and seemed fairly well, though choked considerably while eating bread and milk. Walked with an unsteady gait. By the tenth day was considerably better, though there were several attacks of tetany each day. From the twelfth to the twentieth day was not observed to have any attacks of tetany. On the twenty-first day fits returned and from then till death occurred, on the thirty-third day, had several attacks of tetany each day. Died in convulsion. At post-mortem thyroid was slightly hypertrophied. No parathyroids could be found, though careful search was made by Prof. Swale Vincent. The spinal cord and the pituitary body were removed for microscopic examination. The thyroid gland on microscopic examination showed a marked change. The shape of the vesicles was very irregular and the amount of the colloid was much less than normal. The intervesicular tissue of the gland had approached that of a normal parathyroid with its solid column of cells. (Figs. 4 and 5.) The spinal cord was treated according to the method described by Vassale and Donaggio (28). It was fixed in Muller's solution for four months, dehydrated in alcohol, stained in nigrosin, differentiated in alcohol and mounted in Canada balsam. No changes were found. The pituitary body was preserved in Flemming's fluid. There was a striking change in the pars intermedia. The layer of epithelial cells, reflected over the nervous portion of the gland, was much hypertrophied and contained numerous vesicles in all respects resembling those found in the normal thyroid. (Fig. 3.) The vesicles were lined with a regular circle of epithelial cells, precisely as in the thyroid. The colloid contents seemed to be of the same character as in the thyroid and appeared to give the same microchemical reaction.

Dog 5. This experiment has already been reported (27). An external parathyroid was found on either side with blood supply such that they could be allowed to remain while the thyroid and internal parathyroids were removed. Remained in good health for 83 days. The temperament seemed changed; it was more playful with people and much more quarrelsome with other dogs. On the 83d day the parathyroids were removed. The right gland has hypertrophied very markedly and the left less so. For three or four days animal was slightly ill, but gradually improved. From that time it continued in about its usual health till the 105th day, when it was observed to be less playful and had sore eyes. The appetite became worse and the animal grew weak and idiotic. From the 121st day constant tremors of the larger muscles were observed, but at no time were convulsions seen, though the animal was kept under closest observation from morning till night. This condition became worse till death occurred on the 127th day. At the post-mortem careful search was made by Professor Swale Vincent and no thyroid tissue or other parathyroids could be found. "The two parathyroids which had been left behind were found to have hypertrophied, and each of them showed on microscopic examination the appearance depicted in Fig. 1. They had, to all intents and purposes, become converted into thyroid. There was still a comparatively large amount of intervesicular tissue which was identical with that of the solid columns forming the normal parathyroid. The vesicles are irregular in shape, though each is surrounded with a regular row of epithelial cells. Colloid is scarce in these vesicles, though it is undoubtedly present in some of them." (27.)

Dog 6. Four parathyroids seen and removed, all verified by microscope, having capsule complete. Lived 28 days. No symptoms. Killed. Serial sections of thyroid. One parathyroid found in substance of left lobe.

Dog 7. Four parathyroids seen and removed, all verified by microscope, having capsule complete. Lived 27 days. No symptoms. Killed. Thyroid examined by cutting serial sections, and no parathyroid tissue was found.

Dog 8. On left side two bodies were removed. On microscopic examination one was reported parathyroid and one a piece of thyroid. On right side whole apparatus was removed. Animal lived 28 days without symptoms. Killed. At post-mortem no parathyroid tissue was found.

Dog 9. Two parathyroids seen on left side and removed. Neither parathyroids were seen on the right side and the thyroid lobe was removed. The animal lived 15 days without symptoms. Killed. No parathyroids were found, but no microscopical examination was made.

Dog 10. Complete operation. On the third day the animal had rapid respirations and stiffness of the legs. The following day had several spells of tetany and was sacrificed on the seventh day while in a convulsion.

Dog 11. Four parathyroids were seen and removed. Dog lived 12 days without symptoms. Killed. No parathyroids were found. Post-mortem, but no microscopical examination was made.

Dog 12. Four parathyroids seen and removed. On the fourth day had rapid respirations and hind legs were very stiff. On the fifth day the respirations reached 120 per minute and there was distinct twitching of the muscles. Animal was not observed in a convulsion, though under constant observation all day. By the eighth day it had recovered and lived without further symptoms till the twenty-first day, when it was sacrificed. At post-mortem no parathyroids were found; microscopical examination, however, was lacking.

Cat 1. Three parathyroids seen on right side and removed. Verified by microscope, having capsule complete. No parathyroids seen on left side. This lobe of the thyroid was removed completely. Lived 23 days. No symptoms. Killed. Right thyroid removed and found much atrophied. Cut in series but no parathyroid tissue was found. On the left a small body was thought to be a parathyroid and was removed. On microscopic examination it was found to be a lymphatic gland.

Cat 2. The right lobe of the thyroid removed; external parathyroid left in situ with good blood supply, but the internal parathyroid was seen and removed, with the lobe of the thyroid on the left side; here blood supply of external parathyroid was so intimate with that of the thyroid, they were removed together. For two days animal was well, third day lay quietly in cage, fourth day nervousness commencing, fifth day tetany commenced, and death in tetany occurred on the sixth day. At post-mortem the parathyroid was found and miscroscopically appeared normal.

Cat 3. No internal parathyroids were seen. The external parathyroids were seen, having blood supply intimate with that of the thyroid. The whole apparatus was removed. The following day had typical tetany and died in tetany 30 hours after operation. Neither thyroid nor parathyroid tissue was found post-mortem.

Cat 4. The right lobe of the thyroid was removed with two parathyroids. On the left side two parathyroids were seen and removed, the lobe of the thyroid was left in situ. On the third and fourth days animal had typical tetany, and on the fifth day died in tetany. Thyroid removed at post-mortem and cut in series. No parathyroid tissue was found.

Cat 5. Four parathyroids seen and removed. Remained well 39 days. Killed. Serial sections cut of the thyroid. A parathyroid was found in the substance of right lobe of the thyroid.

Cat 6. On the right side, two parathyroids seen and removed. On the left side only one parathyroid seen, and this, with the lobe of the thyroid, was removed. Animal remained well for 35 days. Killed. At post-mortem right lobe of thyroid was removed, also small body on left side. Serial sections of the former revealed no parathyroid, and the latter proved to be a lymphatic gland.

Cat 7. Only two parathyroids were seen; the whole apparatus was removed. On the second day had some slight signs of tetany. On the third day was worse, and died in tetany early the fifth day. At post-mortem neither thyroid nor parathyroid tissue was found.

Cat 8. On the left side two parathyroids were seen and removed. On the right side no parathyroids were seen, and the whole lobe of the thyroid was removed. Animal remained well for 30 days. Killed. Left lobe of thyroid removed. Serial sections cut, when a large parathyroid was found.

Cat 9. Four parathyroids were seen, but were not surgically removable. Animal killed under anæsthetic.

Cat 10. Only one parathyroid could be located. This, with the thyroid, was removed. The animal was quite ill from the time of the operation. Refused to eat. Fore limbs flexed; hind limbs stiff. Had tremors commencing the second day and died in typical tetany early the fourth day. At post-mortem, neither thyroid nor parathyroid tissue was found.

Cat 11. Could locate only one parathyroid on either side. Nothing removed, but the thyroid was crushed throughout with tissue forceps. The animal lived 21 days without any symptoms. Killed. At the post-mortem the thyroid was badly damaged but much normal tissue remained.

Cat 12. Thyroid and parathroids removed. On the second day had stiffness of the legs, but no tetany. On third day nervous symptoms were more marked. Killed on the fourth day during an attack of tetany because wound was slightly septic. At the post-mortem neither thyroid nor parathyroid tissue was found.

Rabbit 1. Thyroid removed completely. Both external parathyroids were seen about three-eighths inch away from the thyroid and left in situ with good blood supply. Died the following day without convulsions. At post-mortem external parathyroids were found intact.

Rabbit 2. Thyroid removed completely. The left external parathyroid was seen three-eighths inch away and was preserved with good blood supply. The right external parathyroid was close to the thyroid and in catching a bleeding point its blood supply was damaged, but it was left in situ. Animal remained well for 19 days. Died on the twenty-fifth day without symptoms of tetany. Post-mortem by F. D. Thompson. The left external parathyroid was found with good blood supply. The right external parathyroid had its blood supply cut off.

Rabbit 3. The thyroid was removed completely. The left external parathyroid could not be saved. The right external parathyroid was preserved with a

good blood supply. The internal parathyroids were not seen. (Note made at operation: Right recurrent laryngeal nerve cut.) The animal died the second day. At the post-mortem the right recurrent laryngeal nerve was found cut.

Rabbit 4. The internal parathyroids were not seen. The external parathyroids were very close to the thyroid. The left recurrent laryngeal nerve ran through the thyroid. The thyroid and all parathyroids seen were removed. The animal lived 39 days without symptoms. Killed. At the post-mortem a bit of thyroid was found on either side of the larnyx. There was apparently not much hypertrophy of the thyroid, as only minute shreds were found. No parathyroids were found.

Rabbit 5. The thyroid was removed completely. Both external parathyroids were seen and left in situ with good blood supply. The animal lived 50 days without symptoms. Killed. No parathyroids could be found and no thyroid tissue remained. One body, removed for examination, proved to be lymphoid tissue.

Rabbit 6. The thyroid was removed completely. Both external parathyroids were seen and saved with a good blood supply. The recurrent laryngeal nerve on the left side was accidentally injured with forceps. The animal died the following day, having difficult respiration, but no tetany.

Rabbit 7. Both external parathyroids were preserved with a good blood supply. The thyroid was removed with the internal parathyroids. The animal lived in good health for 33 days. Killed. The parathyroids were not distinguished at post-mortem. Four bodies were removed for examination. On microscopic examination they proved to be lymphoid tissue.

Rabbit 8. The parathyroids were not seen on either side. The thyroid was removed completely. For four days the animal was well. Then breathing became rapid, but no tetany was observed. Died in seven days without tetany.

Rabbit 9. The whole apparatus removed because the blood supply of the parathyroids was intimate with that of the thyroid. The animal remained well for 37 days. Then for two days it was not well and was found dead in cage. Never observed to have any tetany. At post-mortem, by F. D. Thompson, no thyroid or parathyroid tissue was seen. One body removed, proved under microscope to be a lymphatic gland.

Rabbit 10. On the left side the whole apparatus removed. On the right side two parathyroids were seen and removed. The animal lived 30 days without symptoms. Killed. At the post-mortem no parathyroid tissue found. Serial sections were not cut.

Rabbit 11. On the right side the external parathyroid was clearly visible and was removed. On the left side no parathyroid was seen, though search was made from the sternum up. The thyroid was removed completely. The animal died early third day. It was never observed in tetany. At the post mortem neither thyroid nor parathyroid tissue was found.

Rabbit 12. An external parathyroid was easily found on either side. Both were removed with thyroid The animal died early third day without being observed in tetany.

Rabbit 13. The thyroid and parathyroids were removed. The left recurrent laryngeal nerve ran through the thyroid and was injured with resulting respiratory disturbance during the rest of the operation and during the rest of life. Up till the seventh day seemed in fair health, ate very heartily, and was never observed to have tetany, but died that night.

Rabbit 14. The thyroid was removed and the external parathyroids were left in situ with good blood supply. Died of chronic symptoms on the forty-third day. At post-mortem no thyroid tissue was found. The parathyroids easily located. Microscopical examination revealed no changes in them.

Rabbit 15. The thyroid was removed completely, and both external parathyroids were left in situ. The animal lived 86 days without symptoms. Killed. There was no increase in the subcutaneous fat. Marked ascites was present. Both external parathyroids were easily found, but no thyroid tissue remained. Microscopical examination of the parathyroids revealed no change.

Rabbit 16. The thyroid was removed completely, also the left external parathyroids, while the right external parathyroid was left in situ. Remained apparently as well as ever till the fifty-first day, when tetany developed and death ensued one and a half hours later. The right external parathyroid was easily located, and from gross appearance did not seem to be hypertrophied. Its artery was intact. Serial sections revealed no change in its histological structure.

Rabbit 17. The thyroid, with the left parathyroid was removed. The right parathyroid was left in situ with good blood supply. Lived 82 days without symptoms. Killed. The right external parathyroid easily found. No thyroid tissue present. There was no increase in the subcutaneous fat; there was slight ascites. The parathyroid examined microscopically showed no change.

Rabbit 18. The thyroid and all the parathyroids removed. In 20 hours the animal had tremors and the fore legs were flexed. The following day it was observed in tetany and died during the third day, of tetany. At the post mortem no thyroid or parathyroid tissue was found.

Rabbit 19. Complete operation. The animal lived 45 days without symptoms. Killed. At the post-mortem careful search was made for thyroid and parathyroid tissue. Three small bodies, removed from the former situation of the parathyroids, on microscopic examination proved to be lymphatic glands.

Rabbit 20. Complete operation. The external parathyroids were very large. The animal died of tetany in 32 hours. The post-mortem revealed nothing.

Rabbit 21. The left external parathyroid was superficial to the muscles. The isthmus of the thyroid covered five rings below the larynx. A complete operation was done. The animal had typical tetany during the second day and died 43 hours after operation. Post-mortem revealed nothing.

I wish to thank Professor Vincent for assistance and

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FORCIBLE DILATATION OF THE KIDNEY PELVIS AS A MEANS OF DIAGNOSIS[1]

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EVERY diagnostician is familiar with the great difficulties at times encountered in differentiating obscure abdominal maladies. This is particularly true of diseases located in the right half of the abdomen, and any method that assists in clearing up these difficulties is worthy of our serious consideration.

It is perhaps unnecessary to recall the more common affections which we sometimes have to bear in mind in making a diagnosis, such as tubal or ovarian infections, tubal pregnancy, ovarian cyst with twisted pedicle, appendicitis, and intestinal affections, ureteral calculus and stenoses, kidney affections, and diseases of the biliary and pancreatic systems. I question whether we are puzzled more frequently by conditions in the lower right quadrant where the appendix so often gives rise to atypical symptoms, or in the upper right quadrant where the proximity of kidney, liver, gall-ducts, pancreas, pylorus, duodenum, and hepatic flexure naturally leads to conditions of uncertainty.

The method under discussion most frequently assists in differentiating diseases of the upper right quadrant, but it is often helpful in determining whether given symptoms belong to the upper or lower quadrant. Every surgeon with a wide experience is familiar with cases in which operation alone determined whether past attacks were due to appendicitis, cholecystitis, or floating kidney.

To avoid theorizing and speculating, processes so tempting in dealing with medical conditions hidden from view, I will select a few of the more striking cases to illustrate the value of this method of distension of the kidney pelvis in making a diagnosis. The method originated with Dr. Howard A. Kelly and it was my good fortune to have this occur during my first year of hospital service with him in 1898.

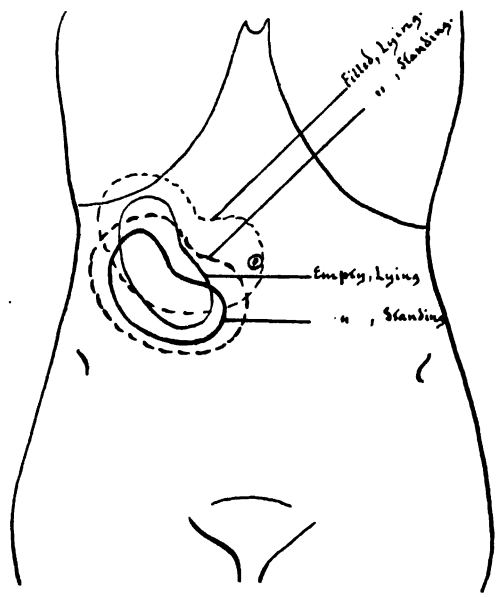

Fig. 1. Showing relative locations of the filled and empty kidney in case 1, with the patient in the dorsal and standing postures.

Case 1. *Floating right kidney with hydronephrosis and typical Dietl's crises.*

This case was seen with my colleague, Dr. Seegar of Baltimore. The drawing (Fig. 1), made during our examination, is more illuminating than a long description.

The patient, aged 22 years, had been suffering for one year with attacks of severe pain in the right side. These attacks, according to the patient's opinion, were not influenced by change of position, but during the attack she could not lie on her right side. They varied in duration from one to twenty-four hours, and after the attack the patient usually passed large quantities of light-colored urine. She was nauseated during the attack but never vomited. She does not know whether she had fever, and she has never noticed blood in the urine. She never called a physician until her last attack, when her family doctor found a large tender mass low in the right abdomen and called Dr. Seegar for a supposed appendix abscess.

On examination the patient showed the narrow feminine type of lower thorax with which one would expect to find movable kidney. The "kidney index"

[1] Read before the Chicago Medical Society, December, 1908.

of Becker and Lennhoff was 89.8. The right kidney was easily carried to any portion of the right abdomen as low as the pelvic brim, and it seemed rather large.

Fluid catheterized from the bladder contained a few leucocytes and epithelial cells and a trace of albumen. The bladder appeared normal. The right ureteral orifice was slightly red and puffy. The right kidney was easily catheterized and the patient was allowed to take the left lateral position. After waiting several minutes without getting a flow of urine through the catheter we began an injection of boric solution and several ounces were taken before the patient finally said an attack was coming on. We then clamped the rubber tubing leading from the end of the renal catheter and allowed the patient to turn to the dorsal position.

A large mass could be seen bulging the right flank and on palpation this was found to lie transversely and to reach from the bulged lateral wall to the umbilicus. Its long measure was 16 cm. and its transverse measure taken almost vertically was 9·cm. The distance from the costal border to the anterior superior spine of the ilium was 10 cm., and the upper end of the kidney mass lay beneath the costal border. Along the superior and anterior aspect of the kidney mass one could plainly palpate a broad notch containing a soft cystic area representing the dilated kidney pelvis.

On unclamping the catheter there was first a gush of air and the patient said, "I have no more pain now." 140 cc. of fluid was collected and more air escaped at intervals. At a later catheterization when care was taken to exclude the air, 172 cc. of fluid was collected after dilating to the point of discomfort.

The drawing shows the results on the kidney position, both when empty and full, of changing the patient from the dorsal to the standing position.

I assisted Dr. Seegar in the operation, which consisted in making the lumbar incision generally used for fixation of the kidney, in exposure and freeing of the perirenal capsule, and instituting drainage by means of two iodoform gauze rubber protective wicks carried from the skin surface through the kidney cortex into the pelvis of the kidney. I prefer this simple drainage operation for these cases of enlarged pelvis in floating kidney to the pyeloplication operation (Israel, Chirurgische Klinik der Nierenkrankheiten, p. 88, Berlin, 1901) largely because of its simplicity and because experience shows that we get the same end result of contraction of the pelvis.

CASE 2. *Floating kidney with attacks approximating Diell's crises.*

Mrs. B. S., age 28, admitted to St. Agnes Hospital July 23, 1907. The patient became pregnant soon after her marriage, three years ago, and had a spontaneous miscarriage at three months with retention of the placenta. She was curetted and packed without anæsthesia, and she dates her ill feelings from the shock incident to this event. The patient now has much flatulence and indigestion and gets attacks in which she feels very nervous, has cold hands and feet, loose bowels, and has a shaking chill and is very faint and prostrated afterward. She has no pain with these attacks but has a queer feeling in the back of her head at the beginning of her nervous attacks. In the past two months she has had attacks every day or two and is afraid to eat because of the indigestion, flatulency, and loose bowels. She has lost twenty pounds in two months, and now weighs but ninety-four pounds. On taking the detailed history I was led to think of the possibility of gall-stones, appendicitis, and of neurasthenia.

Both kidneys were easily palpated and the right was movable to the third degree. On injecting the pelvis of the right kidney without the patient being aware of what was being done she suddenly exclaimed, "Oh, that queer feeling in the back of my head; what are you doing, doctor?" But two drams of fluid returned, showing a normal sized pelvis. The injection was repeated with the same result, but on forcing the injection slightly pain was caused in the right kidney region. The patient was kept in bed for one week, and after being fitted with an abdominal binder she remained in the hospital another week gaining rapidly. She was then allowed to go North for a visit and after five weeks she had gained twelve pounds. She has since given birth to a child and is now in fairly good health.

CASE 3. *Hydropyonephrosis due to stricture of ureter.*

Mrs. S. E. D., age 52, admitted to Church Home, May 7, 1907.

This patient had been complaining of attacks of pain in the left side for thirty-four years. At first these pains were not severe; they were located in the left umbilical region and came on only when driving or getting a sudden jar. At first they were very irregular, from one week to six months apart. After a few years she began to have chills with some of these attacks. At times she had to have medicine and then she often vomited. Lately the attacks have been more frequent and more severe. They come from seven to ten days apart and last from one to twelve hours. She sometimes gets relief by voiding but she never notices an increase in the urine unless she has been drinking more freely. She has never noticed any blood in the urine but she thinks there is pus after the attacks. She has lost fourteen pounds in weight in the past three months.

Examination. See Fig. 2. The patient is a thin woman and a large mass can easily be seen and felt in the left anterior flank region, its lower end reaching a few centimeters below the transumbilical line. This mass is fairly movable and has a semicystic feel.

Cystoscopy. The urine catheterized from the bladder was acid, turbid, sp. gr. 1015, and contained a large number of pus and a few epithelial cells. Urine gathered directly from the right ureteral orifice through the speculum showed no abnormal elements. The left kidney was catheterized and the urine after settling a few minutes had half its volume taken up with a flocculent white deposit. The sp. gr. was 1010 and the reaction slightly alkaline. The microscope showed considerable pus and mucin, and few epithelial cells. No blood, no casts, and no bacteria were seen in the fresh specimen. Unfortunately a culture was not taken.

On injecting the pelvis of the kidney 240 cc. were

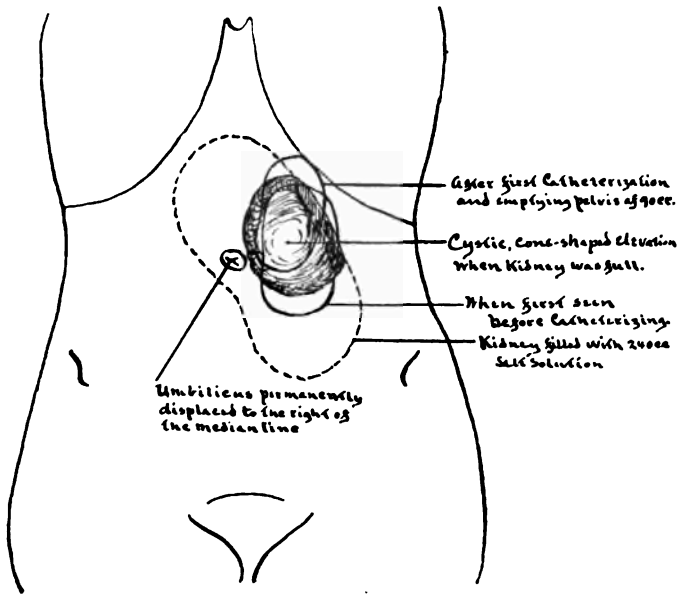
After first Catheterization and emptying pelvis of pus.
Cystic, cone-shaped elevation when kidney was full.
When first seen before Catheterizing.
Kidney filled with 2% boric acid solution
Umbilicus permanently displaced to the right of the median line

Fig. 2. Showing, in case 3, the relative location and size of the kidney when partially full, and when first seen; when empty, and when fully dilated.

introduced before the patient complained of any discomfort. The kidney when thus injected left its position in the left flank and its upper pole reached to the right edge of the right rectus muscle in the epigastric region while the lower pole extended below the level of the anterior superior spine of the ilium and lay under the left rectus muscle. The middle third of this mass was occupied by a cone-shaped elevation presenting just to the left of and above the umbilicus and having a cystic feel.

At operation the kidney was delivered through the usual incision and it was found to be so distended as to present only a thin shell of kidney substance. It was therefore removed together with the upper third of the ureter.

On catheterizing the kidney a wax-tipped catheter was repeatedly obstructed about 2 cm. from the vesico-ureteral orifice, but no scratch marks were obtained and it is probable that the condition of the kidney originated from some form of ureter stricture.

A letter fourteen weeks after the operation reported better health than for years and a gain in weight of eighteen pounds.

CASE 4. *Stone in ureter. Appendicitis symptoms. Injection shows hydronephrosis.*

Miss J. A., age 25. For the past three years the patient has had attacks of pain in the posterior right flank region extending forward to the anterior flank region. These attacks have been irregular, occurring at times as often as two or three in a week. At times she would have none for two or three months. During the attack she feels swollen, and says that her mother can feel a tumor mass. Between the attacks when she stands she has a pulling misery as if something on the right side were too short. She has the same sensation when she lies on the left side. She always has to sleep on the right side. She has been told by one physician that she was suffering from stone in the kidney, and by another that these were appendicitis attacks.

On examination the patient is seen to be a small woman with costal margins very low reaching to the level of the umbilicus. This makes one think of a high kidney index and floating kidneys. Although the kidney index is 89, neither kidney can be palpated, probably because of the very low costal margins.

Cystoscopy. The bladder is normal. Both ureteral orifices are normal although there is slight reddening of the mucous membrane about the right orifice. There is no pouting or eversion of the mucous membrane at the orifice, and nothing except the slight hyperæmia to indicate that there is a diseased condition above. A 2 mm. catheter is prepared with a wax tip and this enters the ureter only two to three cm., where it is obstructed. On withdrawal there is seen to be considerable bleeding from the ureter and the wax is entirely gouged off on one side in a groove with rather precipitous edges. A 1½ mm. catheter is prepared with a small wax tip and this goes by the obstruction with great difficulty. The stilette had to be left in the catheter to stiffen it so that it could be forced past the obstruction. On withdrawal the catheter is tightly grasped by some obstruction until it almost leaves the lower end of the ureter. The wax is gouged off on one side like the first wax tip and on the opposite side there is a deep wide scratched area. It is probable that the catheter took a half turn in its passage to and from the kidney. Up the side of the catheter the gum

elastic material is deeply scratched by parallel lines over a width of 1 mm.

While the catheter was in the kidney the kidney pelvis was injected with about 40 cc. of salt solution before the patient complained of pain. Only 35 cc. returned from the kidney in a steady flow, and it is probable that a few cc. remained in the ureter.

A week later I repeated the catheterization, this time covering a 2 mm. catheter at a point about 6 cm. from its tip with a spindle shaped mass of wax to act as a dilator. An X-ray taken in the meantime had demonstrated a very small stone in the bladder region, and I hoped by the use of a little dilatation to get the stone to pass. About one quarter of the wax spindle was gouged away. I deferred making an injection of oil until another visit.

Forty-eight hours after the dilatation the patient had one of her worst attacks. This was partially controlled by morphia ¼ grain by mouth.

About three weeks later the patient was operated on by another surgeon, who removed the appendix, and took a small stone from the lower end of the right ureter.

Four months later the patient came to me complaining of pain in the right side over the cæcal region. From its character I thought this pain might be due to intestinal adhesions. The operation must have been a severe one for the patient was said to have been in the operating room five hours.

A catheterized specimen of urine showed some pus and epithelial cells, and a culture taken from the kidney yielded colon bacillus growth, but the urine looked almost clear and it contained no albumen. A wax-tipped catheter of 2 mm. diameter passed to the kidney without obstruction and on withdrawal there were no scratch marks.

Forced injection of the kidney pelvis caused a sharp pain in the lumbar region which the patient said was like her previous attacks and not like the pain now troubling her, which was less severe, of a different character, and located in the anterior flank region.

After injection to the point of pain, 15 cc. of urine returned, showing the pelvis to still hold twice a normal amount as contrasted with its former capacity of 40 cc.

CASE 5. *Stone in the ureter. Attacks like Dietl's crises. Infected hydronephrosis.*

Mrs. E. L., age 37. Church Home, June 20, 1906.

A case, very similar to the last, from whom I removed a spindle-shaped stone about 14 mm. long from the lower end of the right ureter about 4 cm. above the bladder. The kidney pelvis and ureter held 45 cc. on injection to discomfort. She had had attacks of severe renal colic for 22 years, these attacks often awakening her suddenly at night, when she would sometimes spring out of bed before becoming thoroughly awake. Her attacks came in sharp, cutting paroxysms of pain beginning in the right flank and stopping in the right groin. She often vomited. While I was injecting the pelvis of the kidney the patient suddenly exclaimed: "For God's sake, doctor, stop, I am going to have one of my attacks"; and she immediately attempted to leave the table, and showed every evidence of mortal terror.

The urine gathered from the right kidney contained considerable pus and yielded a pure culture of colon bacillus. The stone was accurately located by the waxed catheter low in the ureter, and X-ray confirmed the diagnosis.

CASE 6. *Gall-stone attacks with an immense gall-bladder mistaken until injection of the kidney pelvis, for a misplaced kidney.*

Mrs. R. O. E., age 29, admitted to Frederick City Hospital, August 12, 1908. The patient has had a great deal of pain in the abdomen since she was sixteen years of age. Since the birth of her first child nine years ago, she has worked very hard and has had much cramp colic, dyspepsia, and heart palpitation. For the past nine weeks she has noticed a mass in the right flank region. Three weeks ago while shopping she was taken suddenly with faintness and nausea, and pain and tenderness in the upper right quadrant of the abdomen. She went immediately to the office of her family physician and he found a large, movable, tender mass in the upper right quadrant and considered the patient's attack to be one of kidney colic.

I examined the patient first in the dorsal position and found the mass in the right side which I considered a movable kidney, although I was not particularly careful in the examination. This mass on being pushed back toward the kidney position swung outward and upward under the ribs instead of going vertically upwards. This was suggestive of gall-bladder.

On injecting the right kidney pelvis the patient was very definite in locating the pain thus caused more in her back and flank, while she stated that her former pains were located across the upper quadrant and more in front.

Operation showed an immense gall-bladder with distended thin walls. The gall-bladder and cystic duct together formed a mass the size and shape of a small crook-neck squash. The gall-bladder measured six inches in length and three inches in diameter, and the cystic duct was four inches long and three-fourths of an inch in diameter. Incision into the gall-bladder evacuated 400 cc. of opalescent, clear fluid and between 200 and 300 small stones. A separate incision had to be made in the lower end of the cystic duct to deliver a large impacted stone mass which was found to be made up of multiple agglutinated fine stones.

CASE 7. *Gall-stones. Immense hydrops of gall-bladder. Kidney symptoms.*

Mrs. L. L., age 39, admitted to the Church Home, September 29, 1908. This patient presented a mass very similar to that described in the last case. The resident in the hospital, a man with six years of hospital experience, felt certain that the mass in the right flank was the right kidney. I could not feel the right kidney independent of this mass, but from its anterior position and the ease with which it could be displaced far toward the left side I considered the mass a gall-bladder.

On forcible injection of the right kidney pelvis the patient said that the pain was of the same character and that it was located to the right of the umbilicus

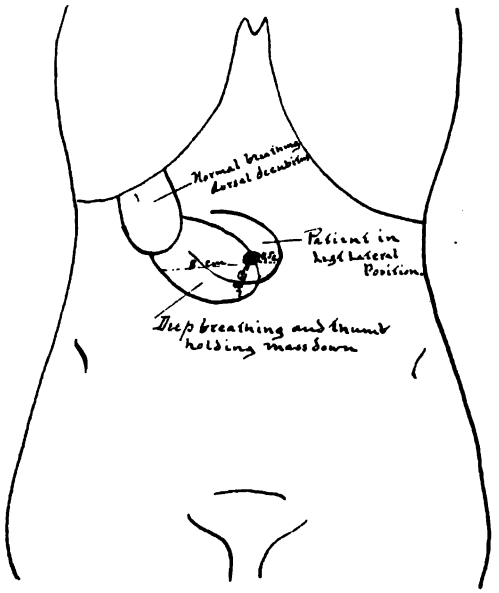

Fig. 3. Showing different positions of the gall-bladder in case 8.

just as the pain before suffered. The pelvis held three drams of solution.

At operation the gall-bladder and cystic duct were very similar in size and shape to those described for the last case. One large stone blocked the lower end of the cystic duct, and the lower end of the gall-bladder projected as a spur back into the foramen of Winslow. The right kidney was unusually high in the paravertebral niche and it had apparently been held in this high position by the backward projection of the gall-bladder. This is a possible explanation for the increase in size of the kidney pelvis and for the pain phenomena, since a portion of her pain may have been due to kidney colic from pressure on the ureter by the gall-bladder.

CASE 8. *Cholecystlithiasis. Hydrops of gall-bladder simulating kidney mass.*

Mrs. A. N., age 42. This patient was seen in October, 1907, at St. Agnes Hospital in consultation with Dr. Seegar. In May, 1907, she had suffered a severe attack of abdominal symptoms which Dr. Pound, her family physician, thought due to gall-stones. During the intervening five months she had suffered more or less pain in the right upper quadrant but she had not had another attack of colic.

At examination (Fig. 3) an elongate mass was found in the upper right quadrant, which on quiet breathing, reached almost to the transumbilical line. On deep breathing the mass could be grasped and pushed downward so that the lower pole reached 5.5 cm. below the umbilicus. With the patient lying in Sims' left lateral position the lower pole of the mass reached 4.5 cm. to the left of the umbilicus. From any position the mass could easily be pushed back to the kidney space beneath the costal margin. It was solid feeling and non-sensitive.

While the mass lay near the anterior abdominal wall and had a pendulum motion, thus suggesting gall-bladder, its ease of replacement to the kidney region and the fact that a right kidney could not be palpated separate from the mass made us think of the mass as of kidney origin, and its density suggested tumor of the kidney. Forcible injection of the kidney pelvis to the point of pain showed the pelvis to hold five drams or two and a half times the normal amount. The patient was positive, however, in locating this pain far back in the posterior flank (kidney) region, and said that her attack of pain in May had been more in the anterior abdominal region and reflected over the abdomen.

At operation Dr. Seegar made a compromise incision through which he might easily operate on the kidney or the gall-bladder. He found the tumor to be an immense hydrops of the gall-bladder caused by an impacted stone in the cystic duct. He was compelled to make a second incision to more easily deal with the cystic duct stone.

CASE 9. *Movable kidney of second degree, with attacks mistaken for appendicitis.*

Miss N. B. M., age 19. Cambridge Hospital, September 22, 1907. The patient has had attacks of pain in the right side since a child. Her mother says that as a child four or five years old she used to have attacks of pain which caused her to bend double and to get white and cold and stiff.

The patient was operated upon three years before I saw her for supposed chronic appendicitis. After the operation even while in the hospital as soon as she took the erect posture, she has the old pain in the appendix region and within six weeks after the operation she had a bad attack of her so-called "cramp colic". She has had repeated attacks since, in which the pain would course down from the right kidney region along the ureter region and into the anterior thigh. She thinks that since the operation the pains have been more pronounced in the back and down the thigh.

During the past year there was no severe attack until five days ago when the patient had a feeling in the abdomen as if suffocating and then an awful "kink" and pain in the appendix region which prevented her straightening up. The cramp-like pains extended down to the heel. She has had no bladder disturbance at any time. There has been but little soreness. She is more comfortable when dressed, the clothing seeming to support her. She sleeps on the right side or back, and if she turns to the left side she feels something come out and drag.

Examination. The right kidney can be grasped and held below the costal margin but it does not impress one as being very movable. There is no special tenderness in the appendix region although the history makes one think of the possibility of adhesions being the cause of the present condition. A wax-tipped bougie was passed to the kidney. The wax tip returned negative. A forced injection of sterile salt solution caused an exact reproduction of her severe attacks and six drams returned showing the pelvis to be three times the normal size. An abdominal binder gave the patient complete relief and she gained considerably in weight and is now attending college and enjoying good health.

CASE 10. *Floating right kidney, third degree. Chronic recurrent appendicitis and ureter obstruction, probably influencing the kidney symptoms.*

Miss L. H., age 30. Union Protestant Infirmary, July, 1907. For the past three years the patient has been suffering with her right side. She has been ill most of the time. At rare intervals she feels perfectly well and then suddenly gets nauseated and sometimes vomits and has a severe, sharp pain in the lower right abdomen and extending down the right leg as far as the knee. She has a dull, sickening feeling in the lower right quadrant most of the time. At times when she sits down she feels something pressing upward in the right side of the abdomen. She works in a dry-goods store and has much standing and much heavy lifting, and thinks this exaggerates her trouble.

About two months ago she had what was called congestion of the womb, which came on suddenly just after menstruation. She had terrible pains in the pelvis and was ill for a week. Since then she has had considerable leucorrhœa.

She sleeps on her right side as this seems to ease the pain.

Dr. Finney saw the patient one year ago and prescribed an abdominal binder, which helped only temporarily. Dr. Finney was kind enough to ask me to take charge of the patient and investigate the kidney condition.

A specimen of urine catheterized from the bladder was normal. There was no evidence of gonorrhœa. The right kidney was fairly movable and rather large and tender and occupied a position near the appendix region. On passing a renal catheter it was obstructed at a point about 6 cm. beyond the bladder, and on withdrawal the tip showed a bent condition. A few days later a wax-tipped catheter was passed and met the obstruction at about the same point, but the catheter passed to the kidney without scratching the wax tip. Injection of the kidney pelvis caused severe cramp-like pains which the patient located higher than the severe attack of pain she had two months ago during the attack of so-called womb trouble. But she says that the attack corresponds in character and location to the attacks of the past three years. The kidney pelvis held two drams.

I considered this a patient suffering both from chronic appendicitis and movable kidney symptoms. At operation a small myoma was enucelated from the uterus, the appendix was found to be bound by many adhesions to the pelvic brim over the ureter region. The appendix was doubled on itself and considerably inflamed. After closure of the abdominal wound the kidney was fixed through the usual lumbar incision.

CASE 11. *Chronic appendicitis. Appendix adherent over ureter. Injection test seemed to involve kidney as cause of former pains.*

Mrs. E. K., age 37. Frederick City Hospital, June 18, 1908. The patient complains of pain in the right side. Before her marriage seven years ago she was always healthy and stout. Two years ago, while two months' pregnant, she slipped on the ice and had a bad strain in the right side and a miscarriage followed. She has had trouble in the right side ever since. The pain is mostly in the flank region just above the crest of the ilium. Last spring she had her worst attack of pain in the right side, the pain lasting for three or four weeks and causing her to remain in bed for one-half day. She now has the increased pigmentation over the right flank where the skin was blistered by hot applications at that time.

I saw this patient in consultation with Dr. Johnson one year ago, her symptoms then being ascribed by Dr. Johnson to a movable kidney. I decided that she was probably a subject of neurasthenia and we determined on forced feeding to favor replacement of the kidney by an increase of fat. This treatment failed and the patient has lost weight and has fallen into a nervous and complaining condition.

On her second examination in June, 1908, the right kidney was not very movable, but it could be held below the costal margin. Catheterization and injection with salt solution caused pain of the same character and in the same locality as that formerly suffered. This was above the crest of the ilium and far back in the flank. In spite of this test the history sounded so much like a chronic appendix that I decided first to explore the appendix, and if definite trouble was not found, to then fix the kidney. The appendix was found to be long and to be densely fixed by its tip at a point 4 or 5 cm. below the pelvic brim and over the ureter.

I decided that the pain, which had been located principally above the crest of the ilium, might be explained by either of two conditions,— either the fixation of the inflamed appendix over the sacral plexus might cause reflected pain, or the fixation of the appendix over the ureter might have caused swelling of this organ, with slight distension of the kidney and pain reflected to the lower flank as it was from my forced salt solution injection. I therefore removed the appendix and neglected the kidney and the patient had a rapid return of her former weight and good health.

You will readily observe in the account of these cases that this method is not put forth as one of universal and never-failing application. In three instances here recorded, cases 7, 8, and 11, as well as in several not here reported, the results of the examination have not been trusted implicitly. Other circumstances of the case have been weighed against the results of the kidney injection, and the diagnosis made in conformity with what seemed the best line of evidence.

In most instances of going flatly against the indications given by the kidney injection we have been wrong, or we have found conditions indicating that both the kidney and some other organ (usually the gall-bladder or appendix) were concerned in the patient's ill health. For instance, in case 8 the patient was clear

in her statement that the kidney colic caused by the injection was in the posterior flank region, while the attack of pain previously suffered was in the anterior abdominal region. In spite of this Dr. Seegar and I both favored a diagnosis of floating kidney or tumor of the kidney and he made a compromise incision, between the kidney and gall-bladder, only to find it necessary to make a second incision for the removal of a large impacted cystic duct stone. In case 7 the identification by the patient of the pain caused by the injection with her former misery, and the slight increase in the size of the kidney pelvis, both pointed to the movable mass as of kidney origin. Other factors led me to properly diagnose gall-bladder, but the operation revealed the right kidney being held high above its usual situation by the large posterior protrusion of the gall-bladder, and this probably pressed upon the ureter and involved the kidney in the patient's symptoms.

It is of particular interest to note that in cases 6, 7, and 8, each presenting a large cystic gall-bladder due to impacted cystic duct stone, the kidney had been displaced upwards, and in two of the cases the injection showed the kidney pelvis to be slightly enlarged.

In case 11 the injection caused pains of the same character and location as those complained of by the patient; but in view of her past history of trauma, miscarriage, and exacerbations of pain I explored the appendix region and found this organ densely bound by its tip to the posterior wall of the pelvis. You are perhaps familiar with the paper I published recently in the Journal of the American Medical Association (vol. 1, 1908) concerning acute pyelitis due to acute appendicitis. The first of the four cases there reported seemed to find its explanation in the densely adherent appendix lying over the ureter, the recurring attacks of appendicitis probably causing ureteritis and pyelitis.

The method is extremely valuable in studying kidney and ureter conditions per se. The passage of a waxed catheter discovers to a certainty the presence and location of a stone in the ureter. In cases of multiple ureter stones the position of the lowest one only can be determined. Stone in the kidney may be missed by the wax-tipped catheter, but an unusual amount of blood after dilating the pelvis of the kidney is suggestive of the presence of a stone. We are able to study the degree of distension caused by stone in the ureter. In many of these cases the attacks of pain are undoubtedly due to the hydronephrosis rather than to activity of the stone.

The location and nature of ureter strictures can be studied while catheterizing for the kidney injection. Many temporary obstructions are met in passing the catheter which are probably due to peristalsis in the ureter. Such obstructions are easily overcome after a short pause in the manipulation. Other obstructions are met repeatedly in the same locality in a given case and still there may be no other evidence of stricture. These are most often found in the lower half of the ureter and they are probably due to appendix or pelvic inflammations having displaced local areas of the ureter.

Cultures taken during the examination reveal the presence and character of an infection.

We can measure the degree of hydro- or pyonephrosis and by collecting the urines from the two sides we can make the urea or the freezing test and know before the operation the working value of each kidney, and have a provisional idea as to whether the operation should be a nephrectomy or a simple drainage.

The greatest utility of the method as regards kidney conditions is in the study of movable kidney with its allied phenomena of torsions, Dietl's crises, hydronephrosis, etc. The kidney colic known as Dietl's crisis occurs most often in kidneys with dilated pelvis, and is probably due in most cases to a sagging of the kidney without a corresponding descensus of the upper end of the ureter, thus causing a kink and an overfilling of the pelvis. This fixation of the upper ureter and consequent angulation on descent of the kidney is due in some cases to supernumerary vessels. and in some to the fixation of the periureteral fascia.

In those cases of Dietl's crisis without permanent enlargement of the pelvis it may be that the same mechanical forces are at work causing a temporary overfilling of the pelvis, or such cases might arise from twist of the kidney pedicle and vascular engorgement.

The polyuria sometimes following Dietl's crisis can scarcely be ascribed to the emptying of the dilated kidney pelvis as was formerly thought, for it is rare to find a pelvis holding more than 250 cc., or half the content of a normal bladder. The polyuria, which often lasts for hours, is probably due to circulatory changes following the ischemia in case of overfull pelvis, or following the passive congestion in case of twist of the kidney pedicle.

In my private records ninety-two cases have had signs and symptoms to attract the attention to a movable or floating kidney. Of these, twenty-eight were injected for purposes of diagnosis and ten of these showed pelves holding 15 cc. or more, that is, they showed a capacity twice the usual size or greater. Only three of these had suffered with distinct Dietl's crises. Another case with Dietl's crises had a capacity of 11 cc., or one-half greater than normal. Of the seventeen cases injected whose pelves were normal, or varied only slightly, none had Dietl's crises.

Of sixty-four cases not injected for diagnosis three had attacks like Dietl's crises of a mild grade.

In some of the cases here reported and in many similar ones this method has been of the utmost diagnostic value in helping to decide which of the abdominal organs was diseased. It is of no small importance to the surgeon and particularly to the patient if by this method we can determine that an extremely movable kidney is causing only a portion of the symptoms. In a case recently operated on I tried for two years with indifferent success to make the patient comfortable by abdominal binder and medical treatment at the hands of others. Finally on trying a six weeks' rest in the hospital we found that her occasional attacks of increased discomfort in the right side were accompanied by a slight rise of temperature, coated tongue, loss of appetite, and soreness in the appendix region. On injecting the kidney pelvis with moderate distension the patient said that this imitated the pain in the back and flank, but that her more pronounced discomfort was distinct from this and located just within the anterior superior spine region. The operation of kidney fixation, which had long been thought advisable, was supplemented by removal of a distinctly diseased appendix and it is certain that the kidney fixation alone would have fallen far short of permanent relief.

In my experience not a few patients suffer from symptoms of movable kidney, which have arisen at a comparatively recent date, and subsequent to a history of appendicitis, gall-stones, or pelvic disease. The correction of the original disease results in an increase in fat and the general well being of the patient, and the kidney takes a better position and eventually ceases to cause trouble. An abdominal binder or special corset is an important factor in the post-operative care of such patients.

Method. This diagnostic method is comparatively simple when applied in women. I use the simple tubular cystoscope of Kelly and if the patient is in fair physical condition she takes the knee-breast position during the cystoscopy and renal catheterization. If for any reason this is difficult or impossible I use Sims' posture or the dorsal elevated pelvis position. As soon as the kidney is catheterized the patient is allowed to take the dorsal position or the lateral position with the catheterized side uppermost. It is best to use a large catheter to prevent any back flow in making the injection; and, in cases of hydronephrosis, to prevent leakage while making observations with the pelvis full. A 2 to 2.5 millimeter catheter is satisfactory. The catheter is usually tipped with wax and if a ureteral stone is suspected the wax is applied in rings down the catheter, or the entire surface is covered by sweeping the catheter through a watchglass of hot wax. In this way one can locate a ureter stone accurately.

In making a forced injection of the kidney pelvis one can use a small rubber ear syringe holding one ounce of fluid, in which case the renal catheter should have a rubber tubing shoulder over its outer end, and a metal or glass tubing is used for connecton between the syringe and the rubber shoulder. A more convenient injection apparatus is a glass aspirating syringe with two-way stop cock, short rubber tubing for aspirating the fluid, and blunt needle for injecting the fluid, directly into the renal catheter(see Fig. 4). Sterile water, boracic acid solution, or preferably normal salt solution, is used for the injection, and if for

any reason one anticipates possible leakage around the renal catheter the solution is strongly colored with methylene blue and a glass catheter is left in the bladder during the injection. In making the injection one should distend the kidney slowly and ask the patient to notify the operator when she feels any discomfort. By making a sudden forced injection a severe colic can be induced even in a normal kidney and the pain may be so severe that the patient is unfitted to make comparisons with past attacks of pain.

Fig. 4.

Like most every other diagnostic method this one is subject to misinterpretation. One must often control seeming results by the personal equation of the patient. The perturbation incident to any examination may amount in this manipulation to a degree of fright which profoundly influences the patient's judgment. In rare cases there is caused an unusual amount of pain which lasts several hours, but with care the method is followed day after day in dispensary and private office practice without unpleasant consequences. If the pain or nervousness seem excessive I generally insert a one or two grain opium suppository before the patient leaves the table, and she is advised to rest for a half-hour before starting home.

Treatment. Strictly speaking, the subject of treatment of movable kidney conditions carries us beyond the province of this paper. It is so vitally related to the questions of diagnosis that it will almost inevitably arise in the discussion and for that reason I shall consider the matter briefly at least. In my series of ninety-two cases thirty-three had a fixation of the kidney. I consider such a high percentage of operations absolutely unjustifiable in the average run of cases and wish to state that my attitude toward kidney fixation is a conservative one. It must be remembered that a certain percentage of these cases were sent to me for operation after other means of treatment had been exhausted. In seven of the operated cases I tried abdominal binder or special corset until these were found a failure. In only nine of the cases was operation done for the kidney alone. In other words, in twenty-four of the cases the kidney fixation was done in association with other seemingly necessary operations. Had it not been for the other operations necessitating a general anæsthetic it is probable that the abdominal supporter would have been found helpful, as it has been in many of the unoperated cases.

In thirty-five of the ninety-two cases, a special binder or corset was fitted, and the results have been such that I recommended this conservative treatment in practically all cases suffering from movable kidney. The exceptions in which I advise operation without trying conservatism are those cases in which injection shows a greatly dilated pelvis holding one ounce or more. In such cases a special corset or binder may give seemingly good results for a time but the patient is almost certain to return for operation. Another class with symptoms referable to movable kidney for which I advise operation includes those patients who need an operation for some other malady and in which the kidney operation can be combined without too much risk.

It is because of these combined operations in the majority of cases that one cannot say just how much the fixation of the kidney does for the patient. We have probably all had the experience of removing a chronic appendix or of doing necessary pelvic operations without fixing a movable, symptom-producing kidney, and seeing the patient regain tissue tone and fat and cease complaining of these kidney symptoms.

For similar reasons one cannot give statistical results from a series of kidney cases fitted with an abdominal support. The support is often fitted after an operation on other organs, or a pessary is simultaneously introduced to correct a malposition of the pelvic organs, or some other line of treatment is instituted at the same time, making it difficult to say just how much of the patient's improvement can be ascribed to the abdominal support.

REMARKS ON THE OPERATIVE TREATMENT OF TUMORS OF THE HYPOPHYSIS[1]

WITH THE REPORT OF TWO CASES OPERATED ON BY AN ORO-NASAL METHOD

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IN reviewing the literature on the operative treatment of tumors of the hypophysis, we find that many of the procedures proposed are based only on experience gained in the deadhouse and not upon operations performed on the living. Most of these proposed methods have yet to be tried in the operating room before their merits and their defects can be properly estimated.

Of the operations proposed, two principal routes have been chosen to reach the hypophysis. First, the intracranial; second, the extracranial or transphenoidal.

Through the former the hypophysis may be reached either by way of the anterior or the middle cranial fossæ. The major part of the operation may be accomplished by working outside of the dura, extradural, or the dura may be opened in the beginning and the work done entirely within its cavity.

The possibility of reaching the hypophysis through the middle cranial fossa was first proposed by Caton and Paul (1), but was not carried out by them. Horsley is generally quoted as following this route.

In reviewing the literature, I was unable to find any case reported by Horsley. From a personal communication from him I learn that he has not published any of the cases operated on by him, therefore, I am unable to verify the statement generally made by writers on this subject, that he operates by way of the middle fossa and reaches the hypophysis by opening the dura and elevating the temporosphenoidal lobe from the base of the skull.

Stumme(2) quotes a personal communication from Professor Petrien, in which he credits Dahlgren with an operation conducted through the middle fossa. In this the dura was opened and the hypophysis reached by retracting the brain. Nothing is said of the details of the operation or of the result.

Krause (3) suggested what appears to be the most rational intracranial method of reaching the hypophysis. He proposed to open the cranial cavity by an osteoplastic resection of the frontal bone and to proceed, extradurally, through the anterior cranial fossa until the lesser wing of the sphenoid is reached, and then to open the dura and remove the tumor by means of a small hook-shaped knife devised for that purpose. Krause, from his experience gained only by operations on the cadaver, believed that by following this extradural route all or most of the obstacles which other operators had encountered would be eliminated.

Borchard(4) attempted to remove a tumor of the hypophysis by the Krause method, and was forced to abandon it because of the hæmorrhage. Later he operated successfully on the same patient by the transphenoidal route, as practiced by Schloffer.

Kiliani (5), in discussing tumors of the chiasm, suggests an operation which is similar to that of Krause, excepting that the dura is opened immediately after entering the cranial cavity. The longitudinal sinus is ligated, the frontal lobe lifted from the base of the skull, and the tumor attacked above the chiasm and the transverse sinus, by means of a sharp spoon.

In a recent number of the Wiener Klinische Wochenschrift, Silbermark (6) suggests a temporal intracranial method similar to that employed by Paulesco and Cushing (7), in their experimental work on dogs. This consists in a bilateral craniectomy, the counter opening being made to permit of the temporal lobe being dislocated without the risk of serious compression. The operation proposed by

[1] Read before the American Surgical Association, Washington, May, 1910.

Silbermark and by him performed on the cadaver has never been tried on the living.

The relative merit of the intracranial method as compared to the transphenoidal is still a matter for discussion. Most operators have chosen the latter. Up to the present time no one has successfully removed a tumor of the hypophysis through the anterior intracranial route.

The temporal route, by way of the middle fossa, has been followed by Dahlgren and Horsley (8).

The anatomical structures that come in relation to the operative field are many and of great importance. Injury to the large venous sinuses, if not a serious menace to the life of the patient, would at least delay the operation and would probably preclude the possibility of completing the operation in one sitting. In the intracranial operation, aside from the danger of injury to the important blood-vessels and nerves, retraction of the brain sufficient to expose the hypophysis is likely to be followed by softening or necrosis, as a result of the trauma and interference with its blood supply.

The lateral intracranial operation has been employed by Cushing in over one hundred experiments on dogs. While by this method the canine hypophysis is readily exposed, Cushing is of the opinion that it is not practicable in operations on the human, excepting possibly in benign cysts of the gland that project into the infundibular region. In cases where the growth occupies the sella turcica, it would be impossible to reach it excepting by the transphenoidal route.

The first to suggest the transphenoidal extracranial operation was Koenig (9), in 1898. His procedure was identical with the oro-nasal operation practiced by Friedman and Maas on animals, and by Gussenbauer for the removal of naso-pharyngeal growth. It consists in separating the muco-periosteal covering from the palatal process of the superior maxilla, after which the process is chiseled away and the superior maxilla split and the lateral halves retracted. The septum and vomer are removed with the other structures of the nose that may obscure the view of the operator. The sphenoid cells are opened and their posterior walls chiseled away, bringing into view the hypophysis.

A similar operation has been proposed by Loewe (10). The nose is split by means of a long incision to one side of the median line, the maxillæ are separated, the inner walls of the maxillary sinus are removed, from the canine fossa upwards, and the septum divided back to the vomer, which is removed and the sinuses entered by chiseling away their anterior walls. The sella is reached through the sphenoid cells.

It will be seen that the bucco-nasal route of Koenig and the operation of Loewe are in reality quite similar in the essential features to the later inferior nasal operations. The strongest objections urged against both of these procedures is that they are unnecessarily severe and disfiguring. They have the advantage of offering the most direct route to the sphenoid cells with least risk of entering the cranial cavity anterior to the sella.

The first to suggest the superior nasal route was Giordano (11). This method, as practiced by him on the cadaver, consists in an osteoplastic resection of the anterior wall of the frontal sinuses and the nose. These structures are turned down and the ethmoid cells opened and their walls removed. The cells of the sphenoid are then opened and the hypophysis reached through an opening in the anterior wall of the sella.

The operation of Giordano has been followed, though slightly modified, at times by all who have chosen the superior nasal route in operating on the hypophysis.

Schloffer (12) in 1907, successfully removed a tumor of the hypophysis by a similar method. The steps of his operation were as follows:

An incision above and to the left of the nose; the whole nose turned down and to the right; excision of all of the turbinate bodies, septum, inner wall of the orbit nearly to the optic foramen; removal of the inner wall of the left maxillary sinus and part of the left nasal process of the superior maxilla; opening of the ethmoid cells and extirpation of their walls; opening of the sphenoidal cells through which the sella is broken down. The tumor was recognized as a pulsating mass, projecting through the opening in the sphenoid, and was curetted away with a sharp spoon. The pa-

tient survived two and one-half months. Autopsy showed that only about one-sixth of the growth remained.

The operation proposed by Moskowiez and Tandler (13) differs slightly from that practiced by Schloffer. The inner wall of the orbit and that of the antrum are not disturbed. They also recommend that the operation be performed in two steps. The first takes the operator to the posterior wall of the sphenoid sinus, which is permitted to remain intact. A pedunculated flap of skin is then turned down from the forehead, so that the end comes to lie on the sinus wall. At the second step the posterior wall of the sinus is broken down, and the end of the skin flap pressed into the cavity remaining after opening the sella and removing the tumor. This is held in place by a tampon. The skin flap is so placed, in order to lessen the dangers of infection. This step seems to be of questionable value. It would appear to enhance rather than minimize the risk of infection of the meninges.

v. Eiselsberg (14) in the three cases published followed the superior nasal route. The incision described differs slightly from that employed by Schloffer, in that a vertical incision along the median line of the forehead meets a curved incision above the root of the nose. The nose, with the anterior wall of the frontal sinus, are reflected downwards and to the right. The septum is divided and the superior turbinates removed. The vomer is removed piece by piece up to its root. After lifting the periosteum from the anterior wall of the sphenoid, the sinuses are opened by chiseling into them. The tumor is then exposed by removing their posterior walls.

Borchard, in 1908, exhibited a patient at the German Surgical Congress in Berlin, from whom he had removed a portion of a tumor of the hypophysis. He first attempted its removal through a frontal intracranial operation. This failed on account of profuse hæmorrhage making it impossible to locate the hypophysis. Later, through the superior nasal route, as practiced by Schloffer, he succeeded in exposing the tumor and removing a part of it.

Stumme, in 1908, describes an operation performed by Hochenegg upon a patient suffering from acromegaly, with other symptoms of pituitary tumor. The technique followed was similar to that of v. Eiselsberg. The anæsthetic employed was Billroth's mixture, preliminary to the administration of which the post-nares were tamponed with gauze. After turning down the nose, an osteoplastic flap containing the anterior walls of the frontal sinuses was reflected upwards. The septum and the entire contents of the nose, including all of the turbinates, were removed. The inner wall of the antrum and orbit were left intact. The sphenoidal sinuses were opened by means of a chisel and later their posterior walls, exposing the tumor, which was removed by a spoon-shaped instrument. The cavity was packed with gauze and the nose replaced and sutured.

Cushing has operated on three cases. In the first, an acromegalic, employed the supranasal operation, similar in detail to that of Hochenegg, excepting that the anterior walls of the frontal sinus were turned down with the nose. Preliminary tracheotomy was performed; the nares plugged with a sea sponge. The Rose position was maintained during the operation, as in Hochenegg's case. After rongeuring away the walls of the ethmoid cells, a narrow mesial channel (two centimeters wide) was chiseled below the ethmoid roof and carried back to the sphenoid cells. The anterior walls of the cells were then broken down and the median projection of the sella into the cells was located. The thin, bony wall of the sella was then clipped away, exposing a pocket of dura enclosing the gland. This was incised longitudinally, and a half of the exposed gland removed.

In a personal communication, Cushing mentions two unpublished cases, operated upon by him, one by turning down the nose as Kocher did, and the other by a method similar to the one employed by me.

In November, 1909, Kanavel (15), of Chicago, published a method of approach in removing tumors of the hypophysis that he termed the infranasal route. At the time of publication of the paper, the operation had not been performed upon the living subject by Kanavel. After a series of experiments on the cadaver and a trial of the various operative procedures recommended by others, he came to the con-

clusion that the hypophysis could be best reached by turning up the nose and proceeding directly to the sphenoid cells, without interfering with the ethmoid, after removing the turbinates, deflecting the septum, and cutting away the vomer.

Recently, in the Journal of the American Medical Association, West (16), of Baltimore, recommends practically the same procedure, excepting that the operation be conducted through the nose. West recommends that the operation be performed in two stages, and that the preliminary operation of removal of the middle and inferior turbinates be done under local anæsthesia. The septum and vomer are removed at the second operation, after which the cells are opened and the sella chiseled through.

In July, 1909, having in my service at the St. Luke's Hospital, a patient suffering from tumor of the hypophysis, I became interested in the operative methods proposed for the removal of tumors of this region. In the course of my work I became acquainted with Kanavel's laboratory work on this subject, and was impressed with the advantages claimed for the lower nasal route. I accordingly operated on my first patient on July 21, 1909, adopting a modification of the infranasal route which is in reality an oro-nasal operation without the trauma and disfiguration that must follow Koenig's operation. The first step of the operation is the same as pictured in Loewe's "Chirurgie der Nase," published in 1905.

The history of the case and the technique of the operation are as follows:

CASE 1. H. R., male, 39 years old. He dates his illness back two years, beginning with frontal headache of a pricking, sticking character. His eyesight began to fail a year ago. The presence of aortic regurgitation and perforated nasal septum suggested syphilis, and therefore a course of mercury and potassium iodide was given by various doctors for a number of months, while his condition became progressively worse. There were no signs of acromegaly nor of the typus Froehlich, and therefore the diagnosis was not made until bitemporal hemianopsia was added to the initial general narrowing of the visual fields, and bilateral optic atrophy appeared. There was some polyuria.

Patient denied syphilis. He had rheumatism eighteen years ago, followed by aortic regurgitation of a mild character. He was injured nine years ago by a blow between the eyes, which made him unconscious for fifteen minutes. Otherwise he has always been in splendid health. Has noticed diminished sexual power for one year. He is married, but has no children. A sister has chorea. No case of tumor in the family. The father died of rheumatism.

Examination of the field of vision, made on many different occasions at the Illinois Charitable Eye and Ear Infirmary, where he was a patient between April 2d, the date of his admission, and June 25th, when he was discharged, showed contractions of the field of vision in all directions, but greatest on the temporal side. On no examination did the field of vision extend ten degrees on the temporal side, nor greater than thirty degrees in any direction. Neither was there any perception of green in either eye. The field of vision steadily diminished from the time of his admission until his discharge, when it was recorded as in the right eye, 4/200; the left eye, 5/200.

Operation July 21, 1909.

Technique. Assistants, Drs. Norval H. Pierce, Allen B. Kanavel, and H. E. Wheeler. Usual preparation. The anæsthetic was started with ether. A high tracheotomy was done and a Trendelenburg balloon canula inserted. Chloroform was now used for the anæsthetic. The nasal cavities were packed with adrenalin gauze and the pharynx tamponed. The upper lip was raised and an incision made in its mucous membrane, about five-sixths of an inch from the mucocutaneous junction, and parallel to the alveolar process. The soft tissues were freed and the nose gradually drawn up with retractors. The septum was being divided with bone forceps, and displaced upwards and laterally. The lower turbinates, the vomer, and the perpendicular plate of the ethmoid were removed. At a previous operation, at the Illinois Charitable Eye and Ear Infirmary, the middle turbinates had been removed by Dr. Norval H. Pierce. An opening was then made through the anterior wall sphenoidal sinus and a blue-colored pulsating mass seen. The membrane covering the tumor protruding into the opening into the sphenoid was incised. The tumor was then curetted out with a dull curette. The whole cavity, now the shape of a cylinder, one inch in diameter and five inches long, was thoroughly flushed with normal salt solution and subsequently packed with iodoform gauze. The septum was sutured back, and the mucous membrane of the mouth replaced and sutured, and the tracheotomy tube removed.

Subsequent history. During the first forty-eight hours the patient's temperature varied from 100° to 102°, rectally, and the pulse from 100 to 120. His condition was fair, his mind clear, and he was free from pain. At the end of forty-eight hours the packing was removed and replaced immediately by the senior house surgeon. Following the repacking of the cavity the temperature rapidly rose until it reached 105°, with a pulse of 160. The patient became somnolent and could only be aroused with difficulty. This condition lasted for twenty-four hours. Upon removing the gauze pack and irrigating the cavity, the temperature fell rapidly until, at the beginning of the fourth day, his temperature reached normal, and from that time on no untoward symptoms developed. The patient

Fig. 1. Trendelenburg canula inserted; lip retracted showing incision in mucous membrane parallel to alveolar process.

left the hospital at the end of five weeks, free from pain, and with marked improvement in the vision. The right eye was 4/200 before operation, and at the end of the second week after operation it was 6/15; left eye was 5/200 before operation, and 6/22 after the operation. He continued to improve, resuming his occupation as driver of an express wagon on the first of December, and since that time has enjoyed good health.

Detailed examination of the eyes, by Dr. C. D. Wescott. September 3, 1909. External eyes normal. The pupillary reflexes, direct and consensual, were present, but slow, and the movements of the iris slight. Wernicke's hemiopic reaction was not present. In normal light the pupils were of average size, 3 to 3½ millimeters in diameter. Vision was 6/30 with each eye. The red glass showed crossed diplopia and binocular single vision was not present. Under homatropine and cocaine his refraction was as follows:

Right: 0.75 1.00 Cyl. Ax .90 V. 6/15.
Left: 1.00 0.50 Cyl. Ax .90 V. 6/22–1.

With his glasses, his vision is doubled in the right eye, and he is able to read with either eye separately, but binocular vision is impossible. There is no apparent divergence and the excursions of the eyes seem to be normal in all directions, although it is very difficult for him to fix an object quickly with either eye.

The fields show the bitemporal hemianopsia characteristic of pressure on the chiasm, but the field

Fig. 2. Nose and lip retracted after division of septum. Turbinate bodies exposed.

of the right eye shows also a very great narrowing. It is interesting to note that the patient has a better central vision in the eye having the smaller field of vision.

The ophthalmoscope shows a pale gray disk and narrowed vessels in both eyes. There is no physiological cup and the appearance is very suggestive of secondary atrophy, but the patient has been under observation at the Illinois Charitable Eye and Ear Infirmary and at St. Luke's Hospital since April 2d, and there is no history of choked disk.

Pathological report, by Dr. Dean Lewis. The specimen consisted of several fragments of tissue which were fixed in Zenker's fluid embedded in paraffin and, after sectioning, stained with a number of different stains, such as hæmatoxylin and eosin, Van Gieson's picrofuchsin, neutral gentian, and iron hæmatoxylin. The two latter stains were employed with the idea of determining whether specific granules could be found in the cells, or whether intercellular bridges were present.

Histologically, this tissue consists of a number of

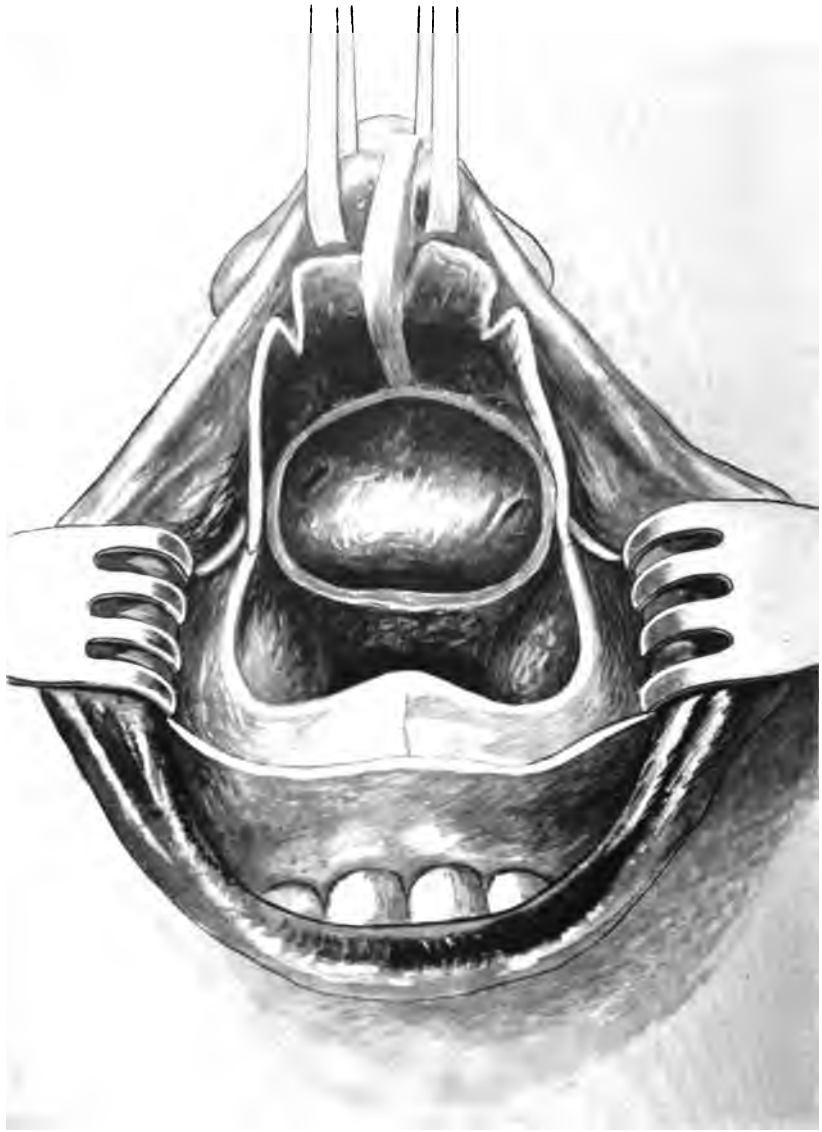

Fig. 3. Nose and lip retracted over forehead. Through the mouth is seen the nasal cavity after removal of turbinates, bony septum, and vomer. Body of sphenoid exposed.

papillary growths supported by a delicate connective tissue stroma. In some sections distinct groups of polygonal cells are found. This polygonal form is evidently due to the transverse cutting of cells, to be described later. The cells resting upon the connective tissue stalk are columnar. They have at their base a clear cytoplasm, but the peripheral part of the cells usually is composed of a cytoplasm, which stains more heavily with eosin. In none of the cells is there any evidence of keratohyalin. As yet no intercellular bridges have been demonstrated. In some cases granules have been stained within the cells, but in most instances these granules seem to represent nodal points in the spongioplasm of the cell. In some places the columnar cells seem to be arranged around a lumen, which is very small, which seems to contain in some instances a little mucoid material.

The histological significance of a tumor of this character occurring within the sella turcica is a little difficult of interpretation. It corresponds in many

ways with the tumor described by Saxer, originating from the infundibulum, which he believed to have originated from the cells of the pars intermedia of the hypophysis.

This tumor has later been regarded by Erdheim as originating from embryonal pharyngeal epithelium, which in some instances lies encapsulated in the anterior part of the anterior lobe of the hypophysis. He has found this undifferentiated pharyngeal epithelium in ten out of thirteen hypophyses examined by him.

The growth is an epithelial tumor developing in the sella turcica from fragments of undifferentiated epithelium developing from the craniopharyngeal duct.

CASE 2. The second patient was an unmarried woman, aged 32. Was referred by Dr. Hugh T. Patrick. Her illness began two years ago, with eye symptoms, which progressed under various diagnoses until the appearance of bitemporal hemianopsia, optic atrophy, severe headache and vomiting, with some rather slight acromegalic changes, made an unmistakable picture. Her menses have been irregular for over twelve years, but not diminished in amount. No polyuria, adiposity, or changes in the external sex characteristics. Constipation marked. Her mother died of a uterine tumor.

Eye findings, by Dr. Wanamaker. Vision, left eye, counts fingers at two feet, when placed at the nasal side. Vision, right eye, equals 91200 — no Jaeger. She has been wearing, left eye x 0.25 s = x 0.50 c. ax. 90; right eye, x 0.75 s = x 0.50 c. ax. 90. Her glasses did not improve her vision, neither can it be helped by any lenses. Lids, conjunctiva, and cornea normal. Her pupils are equal, about 4 mm. in diameter. React sluggishly to light, the left more so than the right. Wernicke's pupillary reaction sign present. Tension, both eyes, normal. Muscles, O. K.

Ophthalmoscopic examination showed: Left eye: media clear; nerve head of a dirty white color. The pigment ring is irregular, veins are distended and rather tortuous. Fundus, right eye: Nerve head is a dirty gray, veins are also distended.

Retinoscopy: Shows scarcely any refractive error B. E.

Field of vision. Left eye: Patient unable to recognize colors, but could see motion in a contracted degree to nasal side.

Right eye: Could not recognize red or green colors.

The field for white was slightly contracted on nasal side and field for blue considerably contracted — absolutely no vision to the temporal side. See perimeter charts.

Operation, at St. Luke's Hospital, January 3, 1910.

Technique. Usual preparation. The anæsthesia was started with ether. A high tracheotomy was done and a Trendelenburg canula inserted. Choloroform was now used for the anæsthetic. A gauze tampon was packed into the pharynx and aditus laryngis. The upper lip was raised and an incision made in its mucous membrane, about five-sixth of an inch from the mucocutaneous junction, and parallel to the lip. The upper lip was then separated from the superior maxilla by blunt dissection and use of the elevator and gradually retracted.

H. R. (case 1). Photograph taken two and one-half months after operation.

The alæ and cartilaginous septum were reflected upward and held by retractor. The nasal cavity was opened and the turbinates, vomer, and the perpendicular plate of the ethmoid were removed. The anterior wall of the sphenoid sinus was removed by the Hajek punch and pliers. The hæmorrhage was stopped by packing with adrenalin gauze for five minutes. The posterior wall of the sphenoid sinus was then removed by the Hajek punch and pliers. Hæmorrhage was again stopped by an adrenalin tampon. The fatty tissue of the hypophysis capsule was next removed and then a cyst-like structure with gelatinous contents, not unlike soft granulation tissue.

The whole cavity was packed with iodoform gauze, four strips, two coming from the nares and two from the mucous membrane incision. The septum was not sutured back nor was the mucous membrane sutured. The tracheotomy tube was not taken out, nor was the packing in the pharynx removed until the patient was back in bed. Then the packing was removed, when she had regained consciousness, and the tracheotomy tube somewhat later. Patient's pulse was then 140.

Just before the conclusion of the operation the patient suddenly stopped breathing, though her pulse remained unchanged. The tracheal canula was removed and found to contain a clot of blood. Patient was very slow in reacting to stimulation (camphor and ammonia), and to artificial respiration. It was nearly three-quarters of an hour before she was breathing naturally again. The pulse, however, remained

strong at all times and increased only about ten beats in rapidity (120 to 130).

The patient had been taking urotropin, thirty grains daily, up to the time of operation, at which time it was stopped. Ten hours after the operation, at 9 P. M., her temperature went up to 105°; pulse 136; respiration 28. She had a temperature of over 102° since it was first taken, three hours after the operation. Examination showed no rigidity of the neck, slight headache, no Babinski, no tache-cerebrale or increase in the reflexes. No cutaneous hyperæsthesia. Lungs negative. The packing was removed. It was odorless. No pus present. Normal salt irrigation.

The next morning at seven o'clock temperature was 104°, pulse 160, respiration 32. Lung examination negative. No physical signs of meningitis. A lumbar puncture was not made. The patient died at two o'clock in the afternoon of the same day. Shortly before death her temperature was 107.4°, pulse 160, respiration 48. A post-mortem was not allowed.

The cause of death seems doubtful and seems to lie between a central circulatory disturbance, and an absorption of crushed hypophysis material. That it was a meningitis fulminans seems less probable.

Histologic report of specimens, by Dr. Dean Lewis. Several pieces of tissue were handed me for examination. These were fixed in Zenker's fluid and imbedded in paraffin. The sections were stained with hæmotoxylin and eosin — copper chrome — hæmotoxylin, neutral gentian and Van Gieson's picrofuchsin. Some of the tissue proved to be pharyngeal epithelium. One piece was from the anterior lobe of the hypophysis. The histologic picture varies in different fields. In some the development of connective tissue is marked, the hypophyseal cells lying in columns surrounded by a fairly dense connective tissue. In the areas presenting the most noticeable changes the cell columns are large and apparently fused, for they are much wider and the cells are more closely packed than is the case in the normal hypophysis. The connective tissue surrounding the separate columns is often greatly reduced in amount and the fusion between the different cell columns can apparently be traced in the different sections.

It is difficult to judge of the relative proportion of the different varieties of cells. In the eosin preparations the chromophile type seems to predominate. In the copper chrome preparation transitional stages can be traced from the chromophobe to the heavily staining chromophile cell loaded with granules. None of the large empty cells described by Scaffidi and Cushing, which they described as the exhausted phase, are found. Karyokinetic figures are seen in some fields.

Histologically there is hyperplasia with adenoma formation, and while no definite statement can be made concerning the proportion of the different cellular elements, it can be stated definitely that the adenoma is not composed entirely of chromophobe elements.

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NECROSIS OF THE BLADDER WITH EXFOLIATION

A Consideration of the Subject, with Two Previously Unreported Cases

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THE writer, having had the opportunity during the last few months to observe two cases of this extremely interesting and fortunately very uncommon condition, trusts that a brief presentation of the subject will be of interest.

I will give the course and clinical histories of the two cases before taking up the different aspects of the subject in general. These two cases are very similar and are good examples of a certain type of the lesion.

Case 1. Thirty-three years of age, primipara. Previous and family history negative. On March 18, 1906, she had a long, hard labor, with a difficult high forceps delivery. She had post-partum retention and had to be catheterized; in spite of precautions cystitis developed. Two weeks after delivery, dysuria and considerable difficulty in passing urine. Nurse noticed small yellow mass at meatus, next day this mass was larger, and on the third day a large yellowish-white spongy membrane, streaked with blood, was passed. There was considerable bladder irritation and hæmaturia for three weeks after passage of the membrane. This became gradually less, but the pain in the bladder and urethra persisted for several months. There was almost complete incontinence.

About three months after delivery a plastic operation on the perineum was performed, which was partially successful. She was seen September 6, 1907, by Dr. Garceau, to whom I am indebted for this note: "When awake and lying down bladder control is fair; when asleep there is dribbling; when on her feet can retain urine one hour only. No pain, no irritation. Examination, lacerated perineum, retroversion, a dense band in the right side of vagina. Cystoscope shows urethra three-fourths of an inch long, sphincter closes transversely, closure fair. Bladder capacity 90 cc. Urine clear. No vesico-vaginal fistula."

The writer first saw her on February 19, 1909, twenty-three months after the exfoliation. The history and condition were as follows: She can hold urine about an hour when up and about, but on laughing or coughing or any sudden unguarded movement, there is incontinence. She has to urinate five or six times at night. Sometimes there is incontinence all the time. Once for a week, following an electrical treatment, she had almost perfect control, but after a second treatment condition returned as bad as ever. There is no pain or irritation. Examination: General condition good. Locally there is a cystocele, rectocele and retroversion, and a cicatricial band in right side of vagina.

Plate 1. Membrane passed by urethra, composed of mucous and submucous coats of the bladder with some elastic fibres; mounted on glass cylinder, actual size. (Dr. J. C. Warren's case, table No. 30.)

Urine spurts from catheter as soon as it has passed a little way beyond meatus. Urine clear, one or two flakes, pale, acid, 1012, no albumen. Bladder capacity, two ounces. Cystoscopy was unsuccessful, as fluid was rejected at once.

March 9, 1909. Patient thinks she has had a little better control. Bladder more tolerant, two and one-half ounces injected but held with difficulty. Cystoscopy still unsatisfactory, but in the glimpse obtained bladder wall looked unusually white.

March 16. The day following the last examination the patient had been better than at any time since her confinement (except for the week mentioned) up to

Plate 2. Much thickened bladder with large diverticulum containing partially exfoliated mucous membrane. (Specimen No. 4968, Warren Museum, Harvard Medical School; male table case No. 15.)

9 o'clock in the evening, when she had an attack of intense pain on micturition which was accompanied with considerable difficulty. Frequency and pain continued all night, there was, however, no incontinence. Next day the discomfort was much less and the following day had disappeared entirely. She has never had a similar attack. Whether the cystoscopy, which was a short examination, was entirely or only partially the cause of this seizure, I am unable to say, but I think the cystocele had something to do with it, for difficult micturition is common in this condition.

Cystoscopy. Urine perfectly clear, few fine flakes. Bladder retains two and one-half ounces. Bladder wall appears white, especially so at top, but it does not seem to be as strikingly so as last time. In places the wall shows trabeculation. In other places there is a suggestion of mild chronic cystitis, that is, the vessels are injected. The ureteric orifices are seen with difficulty, the capacity is so small that the manipulations of the instrument cause pain. The left orifice appears normal and the right widely dilated. The trigone was not well marked and paler than usual. Whether the slightly red appearance of the bladder is connected with the recent attack of pain and difficulty I cannot say at present, as this is the first time that the examination has been satisfactory in any degree.[1]

[1] Since this article was sent to press I am able to add the following: September, 1909. The patient has been having bladder irrigations about every five days with boric acid solution given to the point of toleration of distension. The bladder capacity is now four ounces. During the day there is good control, the intervals between micturitions having lengthened to two hours, at the end of this time there is however, an imperative desire, which, if not relieved, leads to incontinence. On the whole the condition is very much improved. I attribute the improvement to the relief of a certain amount of chronic cystitis which was present. The urine is now clear, with a few flakes which are made up of squamous epithelial cells.

CASE 2. This patient was seen by my colleague, Dr. A. L. Chute, about three months after her confinement and I am indebted to him for permission to report the case, and for the notes of the first cystoscopy. The history is as follows: Woman thirty years old, previous general and urinary history negative. Two children, first pregnancy and labor normal. One and a half years later second labor (July 5, 1908), duration 10 A. M. to 3 P. M, difficult instrumental delivery. Late in the evening she had to be catheterized. She was catheterized the following morning and evening. On the second morning after delivery she thought she did not need to be catheterized as the urine had started to run. In the evening, however, she had to be catheterized because of the extreme pain from bladder distension and in spite of the overflow which had been going on all day, a large quantity of urine was obtained. From that time on the patient has had incontinence. The urine soon became foul in spite of twice a day bladder irrigations. Three weeks after delivery there was a sudden complete retention. The attending physician was immediately summoned and found something protruding from the urethra. Pulling upon this he delivered a large, dirty yellow, foul mass. Patient said this was larger than the hand and filled an ordinary jam jar about one and one-half inches from the bottom.

September 30th (about three months after confinement). She has suffered constantly from her bladder. Incontinence when on her feet; while lying down there is a certain amount of control, but she is obliged to micturate from four to six times a night. The patient is in good general condition. There is a moderate perineal tear, no vesico-vaginal fistula. Nothing remarkable about external meatus. Some excoriation of the neighboring parts. The bladder contained one ounce of foul, turbid urine. Urine pale, foul, turbid, 1004, slightly acid, slight trace of albumen. Sediment considerable, pus free and in clumps, normal and abnormal blood, many round cells, but no squamous cells. Large number of bacteria. Stained specimens show many bacilli and cocci.

Cystoscopy. With a large catheter bladder could be made to hold three ounces of boric solution. Bladder wall everywhere fiery red with masses of shaggy mucopus adherent, nowhere is there any suggestion of normal mucous membrane. The ureters seem to be tremend ously dilated. There was marked tenderness and considerable bleeding.

January 20, 1909 (about six and one-half months after confinement). The condition has gradually improved since last examination. She has been having bladder irrigations with boric acid solution and weak silver nitrate solution 1-5000. To-day for the first time she held urine while on her feet for one and one-half hours; while lying down control somewhat better. Micturition is still painful. The urine examination is the same as of last date, except that the odor is not particularly offensive and the sediment is less.

Cystoscopy. Capacity same, three ounces. The bladder is not nearly so red, so light absorbing, nor so sensitive as of last note. In one place the wall is taking on a whitish look, no blood-vessels seen. There appear to be two good sized cavities in place of the ureteric orifices. Five days later a ureter catheter passed into the left one of these cavities and several drachms of clear urine were obtained (bladder urine turbid), thus proving that they are the widely dilated and very abnormal looking orifices of the ureters.

February 24 (seven and one-half months after confinement). Urine still turbid. Incontinence and bladder pain same.

Cystoscopy. Capacity same. Bladder much improved in appearance. Picture much clearer. The two cavities, which are the ureteric orifices, can be clearly seen. To the outside of the right ureteric opening is what appears to be a shallow diverticulum. Unsuccessful attempts to catheterize right side, bladder had become intolerant.

March 18. Urine turbid with shreds. There is constant slight hæmaturia. If patient empties bladder she remains dry for three-quarters of an hour, after this, complete incontinence.

Cystoscopy. Same as of last note, except much clearer view, large cavernous ureters very distinct. Capacity three ounces.

It is to be regretted that no histological examinations were made in either of these cases, as without them the reports are necessarily incomplete. However, the writer has no doubt, by the subsequent clinical course and the cystoscopic findings, that these were true cases of exfoliation with a very considerable involvement of the muscular coat, as shown by the capacity of the bladder and the loss of sphincteric control. The etiology and prognosis in these cases will be considered under these headings.

History and nomenclature.[1] The passage of membranes from the bladder has been noted since very early times, as shown by an article by Willis (1) in 1650, and a case reported by Tulpius (2) in 1716. The earlier writers thought parts of the mucosa itself were expelled. This was later contradicted by Fontaine (3) and others, and opinion differed from time to time. Soon, however, cases were reported in which the histological examinations showed bladder tissue to be present in the extruded membrane. Luschka's (4) report on Bauer's (5) case, in 1854, and the cases of Lever(6) and Lee (7) being the earliest accurate accounts. The reason for the then existing confusion being the number of different names under which the lesion was described. Even now the condition is very lightly dealt with by most text-books and is variously referred to as "membranous," "pseudomembranous," "croupous," "diphtheritic," "exfoliative," "plastic" and "gangrenous" cystitis, which terms are inadequate and misleading.

It is a well established fact that there are two distinct conditions: First, the false or pseudomembranous type, which may correctly be called "croupous" or diphtheritic" where the membrane is a fibropurulent exudate, and second, the true form where portions of the various structures of the bladder wall have been cast off. This has been proved repeatedly by microscopical examinations. Guyon (8) has described these conditions very fully in a clinical lecture published in 1887. The second group is the one with which we are mainly concerned.

These cases should be described under the name of "necrosis of the bladder" as suggested by Haultain (9). The process may be of any severity and involve any or all coats of the bladder and occur with or without exfoliation That the process is a true necrosis has been shown by experiments and pathological examinations which I shall show later on.

Pseudomembranous type. First, a few words in regard to the pseudomembranous type. It is impossible to differentiate clinically, without histological examination, between the two conditions, as is well shown by the following cases which are selected because a pathological report is given. They are as follows:

Balvay (10). Man, 65, with a twenty-four hour retention, no previous history, except that he had been catheterized for a previous retention. Bladder distended to the umbilicus; no instrument could be passed per urethra; suprapubic puncture unsuccessful; suprapubic drainage, several large pieces of membrane removed. Examination: Layers of fibrin containing pus cells and red corpuscles. No bladder tissues present. Many colon bacilli. Pseudomembrane.

Harrison (11). Delivery by version. Had been catheterized for a week, cystitis developed. On the eighteenth day a membrane passed from urethra. Examination: Fibrin with red blood corpuscles, the whole in state of fatty degeneration. Thought to be an organized hæmorrhage.

Guyon (12). Man, 53. Sudden retention, previously difficult micturition for three months. Cath-

[1] A full account of the early history of this subject can be found in the thesis by Pepin (21).

eterized for five days. Urine became foul. Something over a month later complete retention. Catheterized; urine ammoniacal and fœtid, constant drainage at night. At end of six days passed by urethra a large membrane. Examination showed no organized tissue present.

Savor (13). Woman, 58. Operation for tubo-ovarian cyst and carcinoma of tube. Had had some urinary symptoms previous to operation. Fourth day after operation acute cystitis. Eighth day began passing pieces of membrane which continued for a week. Examination: Many pus cells in a network of fibrin. No bladder tissues.

The formation of a pseudomembrane is not infrequently due to the traumatism and infection during catheterization with the resulting cystitis and the contact of the bladder mucosa with purulent, ammoniacal urine (Balvay). It may also be associated with stone in the bladder, cases being reported by Dolbeau (14). The symptoms do not differ materially from the true form, but the differentiation is important because of the prognosis, complete recovery taking place when the membrane is passed or removed, which may be quite the reverse in the true form. Death results if the membrane is retained.

Appearance and composition of exfoliated membranes. We will now return to the consideration of the second or true type. These membranes are generally passed by the urethra in the female. When not so passed they are found, either at operation or at autopsy, more or less separated from the remaining portion of the bladder wall; sometimes as a completely separated sac containing purulent urine (case of Jacobi, male table No. 3). This accounts for the great difficulty experienced at times in passing a catheter. The membrane may take the form of a cast of the entire bladder, sometimes showing the holes for the ureters, or it may come away in fragments of any size, the membrane in Dr. Warren's case (see cut) being the size of a lady's small handkerchief. In gross appearances the membranes are described as being of a dirty gray or yellowish white color and having a foul odor. They are of varying thickness, from one-eighth to one-third of an inch. One surface has a rough, gritty feel, from the secondary deposit of urinary salts, and the other surface is smooth and may be of a darker color; this surface having been in contact with the remainder of the bladder.

By referring to the table it will be seen that in a number of cases the membrane is described as being composed of the mucous and submucous coats, often with portions of the muscular coat and in a few cases portions of the peritoneum as well [Haultain (9), case 1].

Unfortunately no histological examinations were made in either of the two cases here reported. There are, however, careful examinations on record which I shall quote to show what occurs. The microscopic examination in the case of Margulies (male table No. 14) was as follows: First, necrotic, smooth muscle fiber, arranged as in normal bladder. Second, connective tissue layer of varying thickness to which is attached in places, pieces of necrotic mucous membrane. The blood-vessels in the section were dilated and choked with lime salts (phos. of cal., with am. and mag. phos., probably of secondary origin). Necrosis of muscle was shown by the poor staining and absence of nuclei. The entire thickness of the membrane was filled with bacteria of different kinds, separated and in colonies. Haultain gives with great detail the findings in two cases, one showing the presence of all the coats of the bladder, including a piece of the peritoneum. The blood-vessels were intensely engorged and degenerated, and the various layers showed marked degenerative changes. In the second case the mucous and submucous coats were so altered as to be unrecognizable. In the muscular coat the fibers were swollen and indistinct and minus their nuclei. The vessels were engorged and their contents granular. In other words, both these specimens showed changes due to a coagulation and hyaline necrosis secondary to extreme congestion of the blood-vessels, the process in the last case not being so far advanced.

Instances could easily be multiplied, but these are sufficient to show that the underlying cause must be capable of producing a true necrosis which may involve the structure of the bladder to any depth. This brings us to the etiology of the condition.

Etiology. Taking as a starting point the proposition that this condition is a necrosis, what are the causes of necrosis? The newer

pathologies (15) divide the causes into two groups.

First, direct causes, producing immediate cellular death, they are: (*a*) Chemical and bacterial toxins. (*b*) Mechanical injury. (*c*) Effects of heat and cold.

Second; indirect causes, by interference with the blood supply in various ways: (*a*) Injury or disease of the blood-vessels. (*b*) Embolism. (*c*) Disturbances due to nerve influences. (*d*) Mechanical closure, by ligature, by pressure, or by overstretching the tissues. Any of these causes may be aided by general conditions which weaken the tissue resistance, as age, diabetes, nephritis, acute disease (typhoid fever), debility, etc. The extent of the process is greatly increased by the secondary introduction of bacteria.

Now to apply these various causes to the clinical aspect. By consulting the table it will be seen that the predisposing conditions met with in the female are most commonly retroposition of the pregnant uterus, difficult or prolonged labors, and incarcerated or twisted tumors of the uterus and pelvis. In almost all of these conditions there has been as well an associated retention of urine, sometimes to very great extent (Cocram, table No. 27).

In the male cases retention was present in the majority of cases. In other words, in a majority of all cases pressure on the bladder wall from within or without, or both was or had been present. Therefore, we must accept the fact that this pressure causes in some way an interference with the circulation and plays a large part in the etiology. There are, however, a few cases in the table where neither obstetrical pressure nor retention were present. Here we must take as our etiology the first or direct cause, that of destruction of tissue by bacterial toxins or to assume that an inflammatory process of sufficient severity occurs in the submucous or vascular coat, to occlude by pressure the numerous and delicate blood vessels with the resulting necrosis. More of these cases later.

To return to the effects of interference with the circulation, these have been very carefully put forth in a most excellent monograph by Haultain, and I shall only very briefly review them here. In the first place the blood-vessels of the bladder enter and leave the organ at its base and neck. Any pressure here will, therefore, affect the circulation of the organ.

It is of interest here to note a series of experiments that were performed on rabbits by Heubner (16). He ligated the bladder neck for a period of two hours, after which the circulation was allowed to resume. The animals were killed at various times from a few hours to five or six days later. Examination of the bladders of these animals showed the same conditions of necrosis to be present as has been already described, thus proving that even a temporary interruption of the circulation may cause this condition. He then goes on to state that pressure on the bladder neck is clinically produced by retention of urine and by pressure of the fœtus during labor.

That retention of urine alone can cause necrosis of the bladder was proved by a series of experiments by May (17), who produced artificial retention in dogs.[1] In this connection the case of Dean (male table No. 9) is of interest, a two day retention from impacted urethral calculus, also the cases of retention following surgical operations, Kelly (table No. 17) and Esau (male table No. 10).

Haultain believes that retention causes circulatory obstruction by preventing the venous return. This is explained by the fact that the base and neck of the bladder, which contain the main vessels, offer the greatest resistance to distension by urine during retention, being the fixed part of the bladder. That the veins suffer, 1st from the normal absence of blood pressure, 2d from their compressibility, and 3d from their more superficial position. The arterial supply is not so interfered with, hence the resulting tremendous congestion followed by necrosis.

When retention is associated with an incarcerated pregnant uterus,[2] the chances for necrosis are increased, as the venous return is already interfered with to a greater or less

[1] In these experiments retention was maintained until death occurred in two cases (sixty hours). In these cases the bladder wall was found to be the site of extensive hæmorrhages, particularly in the submucous coat. The mucosa and submucosa were separated at the fundus by an extravasation. The urine was filled with blood and epithelium. In three others the retention was continued intermittently for periods of twenty to thirty hours at a time for three weeks. Examinations of the bladders in these cases showed the mucosa and submucosa broken down and filled with granular material. The blood-vessels were engorged. The urine was ammoniacal and filled with detritus.

[2] Pinard and Varnier (22) have written extensively on the association of this condition with retroverted pregnant uterus.

extent. Retroverted pregnant uterus alone, however, does not seem to exert sufficient pressure to produce necrosis, as in neither Haultain's collection of cases nor my own has exfoliation occurred without an associated retention. It is, however, the cause of the retention and greatly aggravates the condition.

The most unique cause of retention was in case 1 of Gottberg (table No. 21) where a vaginal tumor existed which proved to be a bicornate uterus with atresia and retained menstruation on the left.

In Vahle's case (table No. 3), there was an incarcerated myoma of the uterus with an enormous retention.

When the obstruction of the circulation is due to labor, we have a complete shutting off of the blood supply, due to the pressure of the fœtus upon the bladder neck, with a resulting condition of anæmia. This probably occurs in either a small pelvis with a large child or some abnormal presentations. That this pressure need not be very long to produce changes in the vessels is shown by the experiments of Heubner. With the re-establishment of the circulation comes congestion, then exudation followed by necrosis. Thus we see that in the two conditions, retention and obstetrical pressure, the mechanics of the obstruction are different, the results, however, are the same, both ending in necrosis.

The two cases here reported were undoubtedly due to the second condition, both having hard forceps deliveries. In case 2 there was a retention and over-distension of the bladder In case 1, I believe the retention to have been a post-operative one and was never allowed to become extreme.

In the case of Lohlein (table No. 26) the blood supply was obstructed by the torsion of a fibroid. There seems to be good reason therefore, to assert that interference with the blood supply by retention or pressure is the primary cause in a number of these cases, that bacterial infection and the presence of a foul ammoniacal urine do much to help along I do not doubt in the least.

There are certain cases which cannot be explained by the foregoing. In Dr. Warren's case (table No. 29) there was neither pregnancy nor retention. A dilatation of the vaginal outlet was performed upon a patient who had moderate cystitis. Here was probably a slight trauma to the bladder, but sufficient to light up a severe inflammation.

In the case of Begouin (table No. 15) there was a severe cystitis following immediately the injection of a strongly alkaline solution. I think there must have been here a bacterial infection as well, as I do not believe sodium chloride would have sufficient penetrating power to affect the muscularis.

In the case of Norris (table No. 31) there is no history, except that of a severe colon bacillus cystitis. Here, unfortunately, there is no description of the membrane.

In several of the male cases (Jacobi, male table No. 3; Fenwick, male table No. 7) the only history is that of cystitis. There are also cases associated with calculi (Stein, Dolbeau, Deschamps, male table Nos. 8, 11, 12).

It is not my intention to go at all into the bacteriology of bladder inflammations, but I think the necrosis in all of these cases can be accounted for by the first direct cause of cellular death, that is, bacterial toxine or the production of a severe inflammation, occluding the vessels of a part or the whole of the wall by pressure.

There are three cases occurring with a general systemic condition: The case of Orlowski (table No. 16) following a severe dysentery. The case of Lemaire (Haultain's, table No. 49) where there was a retention during typhoid fever. Death in the 4th week, retention had persisted for two weeks. There had been difficulty in passing the catheter.

The case of Tronchet (male table No. 16) which was that of a diabetic with urethral stricture. There are two cases associated with injury of the spine, Wilks (Haultain's table No. 55) and Southam (male table No. 6) being examples of disturbed circulation due to nerve influences.

Cystoscopic appearances. Although the two cases herein reported are lacking in respect to the pathological findings, I believe the record of the cystoscopic examinations will be of value, as there are but few observations reported upon this most interesting and important feature of the subject. Few as they are, however, they will illustrate the local con-

ditions existing at different periods in the course of the lesion.

Taking the observations in the order of their clinical occurrence, the earliest in the disease is that of Norris (table No. 31) who examined a patient three weeks before exfoliation took place. This was in a case apparently due to infection with the colon bacillus, there being no other etiological feature. He found the bladder contracted, thickened, and reddened with numerous hæmorrhagic areas. The trigone was more intensely injected. There was no actual ulceration.

Next in order comes the very striking observation of Margulies (male table No. 14) who cystoscoped a male patient under chloroform two days before operation. In this case the cystoscope was passed into the interior of the exfoliated sac, which had become almost, if not entirely, separated from the remaining wall. He gives the following description. The surface was everywhere of an equal dirty, gray-white color, and entirely covered with what looked like a fine, short, hair-like crystaline deposit, this had a cilia-like motion with the currents of the bladder fluid. In places there were adherent accumulations of pus. The surface looked like "a piece of dirty, gray-white skin, covered with thickly set, dirty, short hairs." Neither the trigone nor the ureteral orifices could be recognized. There was nowhere any normal bladder structure. The picture was entirely unusual and he was unable to interpret it at the time. Of course after operation the solution was clear. I think next in order come the various appearances described in detail in case 2, reported by the writer. They cover a period of several months, showing the gradual change in the bladder and the approach to the final picture which we will come to presently. They need not be repeated.

Margulies describes the cystoscopic findings in his patient, seven weeks after operation, which are worth giving in full: Bladder holds 150 cc. The fluid is unusually pale, almost white, in places are a few, pale looking vessels. The neck of the bladder, instead of being the usual dark red, is of a pale rose color. The trigone shows no changes on the right; the ureteric orifice being normal and situated on a small papilla. The middle and left portions of the trigone have an uneven appearance under the mucous membrane. The left ureter is dilated and crater-like, but not markedly so. The effluxes are equal and normal. The apex shows a small funnel shaped diverticulum at the site of the operation wound. The shape of the bladder is very little changed. The most striking thing is the white appearance of the wall, especially on the left lateral and upper parts. This is of interest because during the early part of his illness the patient had pain and marked tenderness in the left lower abdomen. In this case a large part of the muscular coat was exfoliated and Margulies concludes that a regeneration of the necrotic parts must have occurred to a considerable extent. That the process was more extensive on the left, and the trigone and structures at the neck very slightly damaged, which accounts for the excellence of the control, urination taking place at normal intervals. I feel that the time, seven weeks, is too short to consider this as an end result.

Stoeckel (18) describes the findings in two cases of exfoliation, which are most striking. In the first case (table No. 19) the result is poor, there being incontinence and a small vesico-vaginal fistula as well. In the second case (table No. 20) recovery occurred and the condition is given at the end of one year and nine months. The pictures are very similar, but in case 2 the sphincter was not seriously involved. He considers the appearances typical of the end result.

CASE 1 (table No. 19). A very abnormal view; nothing to be seen of the trigone or normal ureteral openings. Immediately behind the sphincter two deep funnel shaped openings like diverticulæ, lay on the right and left side and equally distant from the internal orifice of the urethra. They were flat toward the median line and grew deeper towards the outside. These were the much dilated ureter mouths. There were no contractions, they remaining wide open and unchanged, but urine was seen to trickle from each. The rest of the bladder wall was brilliantly white with a few irregularly placed tortuous vessels. The sphincter was represented by a thin pale red band. Below the ureters was a small opening about the size of a normal ureter. This proved to be a vesico-vaginal fistula.

CASE 2 (table No. 20. There is a colored illustration accompanying the description). In this case the bladder wall had the same white appearance and the

ureteric openings were two large, smooth-walled cavities. The bizarre and irregular configuration of the bladder was striking, deep and shallow diverticulæ alternated with projecting bands which divided the bladder into larger or smaller portions, like septa. These trabeculæ were distinguishable by their reddish color. The ureters were catheterized in this case, some difficulty was experienced at the beginning of the ureter in passing the catheter. The base of the bladder was displaced to the left, the right ureteric orifice being in the median line and the left far around to that side.

These descriptions correspond entirely with the appearances found in the writer's case 2, the dilated ureters, the beginning diverticulæ and the beginning whiteness of the wall, the process only being in an earlier stage.

The appearances in the writer's case 1 are given in detail in the case report. While the picture was not normal by any means, no such striking changes are present as in the other cases.

These are all the observations that the writer has been able to collect.[1] There is a short description of the conditions given in Knorr's (19) book on "Cystoscopy in Women." He quotes from Stoeckel.

Symptomatology and diagnosis. The most constant clinical feature of the lesion is the condition of the urine. This is ammoniacal and fœtid, contains albumen, pus and blood, and quantities of detritus. In some cases bits of membrane are passed, containing bladder tissue from which the diagnosis can be made. The urinary symptoms include retention, dribbling from an overflow bladder and also those of an acute cystitis. There is one phenomenon which has been described in a number of cases and when met with should excite suspicion, that is, the inability to empty a full bladder by catheterization. When only a small quantity of urine or pus is obtained the catheter has been occluded by the exfoliated sac. Sometimes there are grave constitutional symptoms with elevation of pulse and temperature. In some a severe course is run without any temperature at all (Margulies' case). In some instances the diagnosis may be made by finding the cystoscopic appearances, but the symptoms as a whole are vague and unclassified. When the membrane presents at the urethra the diagnosis is clear and is easily made from that of inversion of the bladder.

Course. Necrosis of the bladder may be divided anatomically into four groups, according to the various layers involved. First, the mucosa; second, the mucosa and submucosa; third, when the muscular coat is involved as well; and fourth, when the peritoneum is included. The second class is the most common.[2]

In one of the cases, that of Robinson (table No. 32) the membrane was described as being composed of "several imbricated layers of epithelial cells, arranged as in those of a normal bladder. The cells are in part necrotic and show no leucocyte infiltration." The symptoms were slight and the recovery quick. In this case the process was certainly a very superficial one and might well be described as an "exfoliative cystitis."

When the process is limited in extent or confined to the coats, exclusive of the peritoneum, the necrosed tissue is thrown off in the process of repair as in other parts of the body. When there has been retention with stretching of the bladder, separation is said to begin at the fundus, that is, opposite to the place of greatest resistance to dilatation. It is here that the effects of the unequal elasticity of the coats are first manifested, the peritoneal and the external muscular coats being much more distensible than are the internal muscular and the mucosa. Separation having begun and being increased by the outpouring of serum, local necrosis takes place, which is soon followed by perforation of the membrane by the decomposing urine which aids in the dissecting process. This is carried on downward to the neck of the bladder (Boldt, 20). That the neck is the last place to become separated is borne out clinically, as at some operations and autopsies the membrane is found free, except at this point. The membrane is finally expelled by the pressure of the retained urine behind it. When portions of the peritoneum are exfoliated, the neighboring organs take place in the process

[1] Since this article was written Dr. F. R. Hagner of Washington has reported a case of necrosis of the bladder (male table, case 18), in which he was able to make a cystoscopic examination. He says "Bladder capacity enormous, entire mucosa absolutely black, had the appearance of gangrenous tissue. Impossible to obtain a satisfactory view of the outline of the prostate, as it was covered with masses of gangrenous tissue."

[2] The submucosa is the most commonly affected because of the number and delicacy of its blood-vessels.

of repair, a secondary sac being formed by inflammatory adhesions, which later become changed into fibrous tissue (Haultain, 9).

Complications. General sepsis and uræmia are occasionally the cause of death. Perforation and rupture of the bladder occur, but apparently they are not common; when they do occur, however, peritonitis of a virulent nature results. We have seen, however, that portions of the peritoneum may be cast off when protected by pericystic adhesions. These pericystic adhesions occur in severe cases causing distortions of the bladder, as is illustrated in Stoeckel's case 2. The kidneys do not seem to suffer much in this condition, except in the cases of general sepsis, that is, they are rarely mentioned in the descriptions, the case of Begouin being an exception, here a nephritis was said to have resulted.

Prognosis. By consulting the table of thirty-four cases occurring in females collected by the writer, it will be seen that there were eleven deaths. In three was no exfoliation (tables Nos. 1, 2, 3); in one there was rupture of the bladder (table No. 4). In six cases the membrane was exfoliated, but remained in the bladder, one of these deaths being due to uræmia, and in only one case (case of Williams, table No. 7) did death occur when the membrane had been passed. This was apparently a badly septic case, although the notes are very meager. This gives seven fatal cases out of thirty of exfoliation. These figures are a little better than those given by Haultain, who collected fifty-three cases in the female with twenty-five deaths. Of these twenty-five, in fourteen there was no exfoliation, eleven of which were due to rupture of the bladder and three to sepsis or uræmia. Leaving eleven fatal cases out of thirty-nine cases of exfoliation, the total of the two tables being eighteen fatal cases out of sixty-nine, which does not seem a high death rate considering the gravity of the lesion and the fact that in some of the cases which recovered portions of the peritoneum were exfoliated (Haultain's case 1, which is No. 40 of his table, also cases 18, 26, 34, same table). Some of the cases associated with retroposition of the uterus with urinary retention extending over a number of days seem to be very fatal.[1]

In regard to the writer's table of eighteen cases occurring in males, there were eight deaths. In five of these (Bosc, Jacobi, Clarke, Southam, and Museum specimen) detached membranes were found in the bladder at autopsy, one being associated with a diverticulum (Museum specimen) and one case had a fracture of the spine (Southam). The sixth case (Stein) had passed pieces of membrane, but died probably from renal insufficiency or sepsis, having had renal calculus and pyonephrosis. The seventh case (Tronchet) was in a diabetic, and in the eighth (Pepin) operation was so long delayed as to be useless. In the remaining nine cases the membrane was either passed or successfully removed by operation. Haultain gives three fatal cases in men.

The prognosis in general should be guarded, but may be said to be excellent as regards life in both sexes, if the membrane is not retained. Retention of the membrane is followed by death.

As to the functional restoration of the bladder or the end results, these vary all the way from complete recovery to complete incontinence. When the damage has been severe, however, the bladder capacity and control are more or less injured. In the writer's opinion the disability is in proportion to the extent of the destruction of the muscularis, and particularly to the middle layer which is continuous with the sphincter. When the vesical neck and trigone are injured to the extent observed in Stoeckel's case 1 and the writer's case 2, it is not surprising to find incontinence, there being not only distortion and contraction of the bladder, but almost complete destruction of the sphincter as well. If on the other hand, the trigone and vesical neck are only slightly involved, even though a large part of the muscular coat be lost, as in the case of Margulies, functional recovery may take place. He believes that a true regeneration occurred in his patient; the time, seven weeks, seems short to the writer. Be that as it may, we know that large parts of the bladder have been resected surgically both by accident and intention, and that good functional recovery has occurred

[1] According to Duhressen (23) when the retention has persisted fourteen days, necrosis always takes place, no matter what the treatment see cases Gervis and Vahle, table Nos. 1 and 3).

when the more complicated structures of the base have not been disturbed. When the mucous and submucous coats only are affected good recovery will probably take place.

It may be of interest to add here that Dr. Warren's patient is living in this city and is perfectly well, more than fourteen years after the exfoliation. Here, however, the membrane contained elastic fibers, but no muscle. Unfortunately there are only very few accurate descriptions of the final results. In the writer's cases, case 1 being now over two years since the exfoliation, may be taken as an end result. Before treatment the condition was a distressing one, there being incontinence on any unguarded action, as laughing or coughing. After several months of forcible bladder irrigations the control is, however, much improved, micturition taking place about every two hours during the day. At times at night there is incontinence. There is no pain or inflammatory condition, but the capacity is small. At present it seems as if the end result in case 2 would be the same, if not worse, there being very little power in the sphincter.

Treatment. This must be symptomatic at first, consisting of the ordinary internal and local measures used in cystitis. Should retention or difficult micturition be present, constant drainage should be established. If constant drainage fails, drainage by cystotomy is indicated. Of course if the membrane presents at the meatus it is to be removed, followed by frequent intravesical irrigations.

In the cases occurring in men the only hope of recovery is in operation. Although the diagnosis has rarely been suspected the symptoms are fortunately so severe as to demand an exploratory operation. The suprapubic route is preferable. It is a noteworthy fact that all the male cases operated on have recovered, with the exception of case 15, where the membrane was in a diverticulum (see cut) and case 17, where operation was too long delayed.

It seems to the writer that opening the bladder above with complete removal of the membrane and more adequate drainage than afforded by the urethra would yield better results in some of the very septic cases occurring in women, particularly when there is intermittent retention from fragments. No such cases are however reported, the nearest being that of Arroyo (table No. 28) where a vesicovaginal fistula was dilated for better drainage.

Male cases. These cases have been referred to in part in the paragraphs on etiology and prognosis, but there are certain points which will be of interest to take up a little in detail. The most striking fact in the series is the excellence of the result obtained from the operative removal of the membrane. These good results have naturally been mostly among the more recently reported cases, where operation has been undertaken early for obtaining satisfactory bladder drainage. For this reason cases will be reported with increasing frequency in men, although there is little doubt that the disease is much more common in women, because of the complications which may occur during pregnancy and labor.

Spontaneous cure, by passage of the membrane, occurs in a large proportion of the female cases because of the shortness and dilatability of the urethra. This has been reported but once in the male, the case of Buchanon (male table No. 2) where a complete cast of the bladder was passed per urethra, said to have resembled the mucous membrane. There was no examination, but the case is unique in that so large a membrane should be passed per urethra. In Stein's case (male table No. 8) fragments of membrane were so passed. The passage of the membrane entire as well as in pieces has been noted when there has been a perineal wound (male tables Nos. 4, 7, 11, 12, 13, 14). It will be seen by the table that retention, severe cystitis or calculi were present as factors in the etiology in all of the cases but one. That is the case of Margulies, here the etiology is very obscure. This case I have cited so frequently that I think it will be of interest to give a more detailed abstract than is to be found in the table. The original article contains the most complete case report that has been published. It is briefly as follows:

A man, aged 34 years, single, entered hospital July 30, 1903, with difficult micturition, pain and hæmaturia; gave the following history: Previous to his 28th year

had had several attacks of urethritis at intervals of one to one and one-half years, for the last seven years good health. In March, 1903, after exposure, had a moderate urethral discharge which yielded to treatment in six weeks. Urine was then clear. In May, 1903, severe pain in ankles and back, diagnosed as a gonorrhœal condition, he was in bed for a month and a half, and later went to a seaport sanitarium, where he took a course of treatment of baths, etc. For the last three months there had been no sexual exposure, he was feeling well, and was about to return, the only trouble remaining being an obstinate constipation lasting from six to seven days. He went to bed feeling perfectly well, at 3 A. M. got up with tremendous desire to micturate but was unable to do so. After repeated efforts, there was priapism followed by urine and blood. In spite of passing urine the desire continued, followed by almost clear blood every ten to fifteen minutes. Treatment: Ice, ergot, and bladder irrigations. This condition persisted twenty-four hours, nearly exhausting the patient. Urine was turbid, showed blood, albumen, no kidney elements, no odor, no bacteria, was neutral, 1018 sp. gr., a moderate number of leucocytes in the sediment.

The local condition gradually improved and at the end of six days the patient decided to leave for the city. There had been severe pain all this time in the left side of the abdomen.

Examination: Abdomen somewhat large and tender, especially on the left. Palpation showed an enormous fæcal accumulation in colon. Bladder region sensitive, No. 18 sound, urethra uneven, prostatic urethra tender. No stone felt. Prostate small, firm, and slightly tender. Bladder capacity diminished. Urine, dark, bloody, turbid, no odor, sp. gr. 1024, albumen present. Sediment contained pus, blood crystals, no kidney elements, no gonococci or other bacteria. For three days no improvement. Bowels were cleared. Put on constant drainage for a few days with bladder irrigations. In a few days condition improved, urine cleared and contained less blood, abdominal pain almost gone.

On eighth day after admission awakened suddenly by an attack similar to the one described, attempts at micturition bringing only a few drops turbid urine and blood. This persisted for twenty-four hours, yielded to ice and morphia. After a few days constant drainage again put in, urine again contained pus. A week later again improvement under the same treatment. Suddenly a third attack similar to the others lasting twenty-four hours. This time the pain subsided, but the urine contained an increased amount of pus and crystals. From this time on the condition became worse, the urine becoming more foul. Micturition difficult, constant drainage was not tolerated. The bladder could not be emptied with a catheter, only a few drops of pus obtained and irrigation fluid would not return. Operation advised but refused. Patient agreed to be put under chloroform in the hope that a cystoscopic examination could be made. This was done the next day, September 2d. (The findings have already been given under "cystoscopic appearances.") The day following this there was severe suffering from painful and difficult micturition and the patient asked for an operation. On September 4th suprapubic cystotomy was performed. A gray looking mass presented which was easily removed as it seemed to be unattached. This gave the appearance of the removal of the entire bladder. There was almost no bleeding. The remaining wall was red and granular looking. The convalescence was uneventful. The structure of the membrane and the other features in this case have already been given.

That this extraordinary case was one of true necrosis is shown without doubt, but the primary cause is obscure. It is probably due to some bacterial infection, as three seems to be no other reason to suspect an interference with the circulation.

Table. In making the table I have taken from the case reports what seemed to me to be the interesting and essential features. The reports varied greatly in their completeness and must be taken at their face value. I have purposely refrained from abstracting any of the cases collected by Haultain. The reference portion of his table is added for the sake of completeness. The results given as recoveries do not in any sense refer to the local conditions. Those wishing the details are referred to his, or the original articles.

Conclusions. From this brief presentation of the subject I think the following conclusions may be drawn:

1. Necrosis of the bladder occurs as a result, primarily, of interference with the circulation of the organ, aided by bacterial infection.

2. The interference with the circulation may be produced by mechanical pressure outside the bladder, or by bacterial inflammation within the bladder wall.

3. The condition is more common in women than men.

4. The clinical symptoms are vague. Retention (when associated with cystitis) which cannot be relieved with catheter should excite suspicion.

5. There is a typical cystoscopic appearance by which the diagnosis can be made if the examination is made at a certain time.

6. The prognosis as to life, on the whole, is good in women. In severe cases permanent injury to the urinary function will result.

7. The prognosis in men is good if the membrane is removed.

8. Operative treatment is always indicated in men, occasionally so in women.

9. The lesion is a rare one.

10. The careful study of any further cases is to be desired.

In conclusion I wish to thank Dr. W. F. Whitney, Curator of the Warren Museum, for permission to use the Museum's specimens from which the accompanying photographs were made.

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REPORTED CASES OF NECROSIS OF THE BLADDER

COLLECTED BY R. F. O'NEIL, M. D.

CASES OF NECROSIS OF THE BLADDER OCCURRING IN FEMALES

CASES OF NECROSIS WITHOUT EXFOLIATION

1. RASCH. Trans. Obstet. Soc., London, 1889, xxxi, p. 129. *Cause.* Retroflexed gravid uterus with retention. No exfoliation. Bladder wall black and sloughing in places. *Autopsy.* Patient felt something give in abdomen while scrubbing floor, 36 hour retention followed by dribbling. Catheter drew off pint bloody urine. Patient collapsed, died few hours later.

2. GERVIS. Obstetrical Transactions, 1874, No. 16, p. 233. *Cause.* Retrodisplacement, 5 months' pregnancy. Retention. Passed no membrane. No autopsy. Age 33. Two weeks previously retention, since dribbling. Poor condition. Bladder above umbilicus. Catheter, six pints porter colored urine. Uterus replaced. Death next day.

3. VAHLE. Inaug. Dissertation, Marburg, 1893. *Cause.* Incarcerated myoma of uterus with retention. *Autopsy.* Hæmorrhage in bladder wall with necrosis of muscular coat. Intestines adherent to bladder. Local peritonitis. Age 48. Urinary symptoms 14 days. Catheterized 8 days before entrance. Condition poor. 2900 cc. turbid urine drawn on entrance to hospital. Diagnosis of impacted fibroid was made. Death in 4 days.

NECROSIS WITH PERFORATION OR RUPTURE OF BLADDER

4. OLIVER. Lancet, 1890, vol. 1, p. 638. *Cause.* Retroposition, 5 months' pregnancy with retention. No membrane passed. *Autopsy.* Bladder ruptured fundus. Sloughing area 1½ in. square. Peritonitis. Retention with overflow bladder.

CASES OF NECROSIS WITH EXFOLIATION

5. GERVIS. Obstetrical Transactions, 1874, No. 16, p. 233. *Cause.* Retrodisplacement, 4 months' pregnancy, with retention. *Struct. of exfol. memb.* not given. Small pieces of membrane interfered greatly with catheterization. Age 36. Twelve days previously noticed urinary trouble, passed very little urine for last 3 or 4 days. Much distended bladder, urine foul and dark. Uterus replaced. Miscarriage and death next day.

6. FAVELL. Lancet, 1900, vol. 11, p. 1352. *Cause.* Labor. *Struct. of exfol. memb.* "Complete cast of bladder mucous membrane." This was a specimen shown before the Sheffield Med. Chirurg. Soc. It was passed per urethra 6 weeks after labor, no details.

7. WILLIAMS. Obstetrical Transactions, 1874. No. 16, p. 258. *Cause.* 4–5 months' pregnancy with retention. *Struct. of exfol. memb.* "Mucous membrane of bladder passed in a gangrenous condition." Death from sepsis. Bladder enormously distended by 3 days' retention. "In two days membrane was passed."

8. PLAUT. Inaug. Dissertation, Berlin, 1899. *Cause.* Extrauterine pregnancy. *Autopsy.* Bladder contained turbid urine and a completely necrotic membrane said to be mucosa. Peritonitis. General sepsis. Remains of bladder wall showed a diphtheritic membrane and an opening into the uterus. Cervix and vagina also showed a diphtheritic membrane. There was a localized collection of pus on the left. The anterior surface of rectum and posterior surface of uterus covered with black pseudomembrane with an opening into vault of vagina. There had been an operation, probably for drainage.

9. KIWISCH. Vierteljahrschrift fur Heil kunde. Prag. 1844, Zweitt. Quat., p. 37. *Cause.* 5 months' pregnancy. *Struct. of exfol. memb.* Incomplete sac passed composed of mucosa. Painful micturition. Urine dark and foul. Patient aborted ten days after passing membrane. Recovery.

10. OTIS. Boston Med. and Surg. Jour., May 17, 1883, No. 20, p. 458. *Cause.* Delayed 2d stage, postpartum retention. *Struc. of exfol. mem.* Mucous and

submucous coats. Catheterized for a week. Symptoms of acute cystitis. Sudden retention on 33d day after delivery. Membrane found protruding from urethra removed with some difficulty. Incontinence for some time. Recovery slow, but finally complete. Capacity somewhat reduced.

11. CORKHILL. Lancet, 1887, vol. 11, p. 1311. *Cause.* Retroverted uterus. Five months' with retention. *Struct. of exfol. memb.* not given. "Gray sloughing mass." Catheterized under ether 6 pts. foul urine. Miscarried. Membrane appeared at meatus 28 days after retention, was removed in pieces in several days. Recovery. "Holds urine well, which is clear."

12. HASS. Munchen Med. Woch., 1889, xxxvi, p. 401. *Cause.* Uncertain. *Struct. of exfol. memb.* Mucous and submucous coats, elastic, but no muscular fibers seen. Patient had an abortion at 3 months. Position of uterus normal. Had bladder irritation for short time before. Became much worse in spite of local treatment, and 10 days after abortion membrane appeared at meatus. Recovery with frequency.

13. LOCKHART. Montreal Med. Jour., July, 1891, vol. xx, p. 1. *Cause.* Cystitis following a long and difficult labor (?). *Struct. of exfol. memb.* Membrane passed in two pieces. Muscular coat was present. Bladder trouble dates from a difficult labor 2 years ago, 4 days of uterine inertia, this was followed by incontinence, which recovered so that patient could hold urine 3 hours during day, but not at all at night. Condition became so bad, frequency and pain, that she entered hospital, no improvement under treatment. Unsuccessful attempt to repair perineum. About 3 mos. after entrance passed two pieces membrane, after which was gradual recovery. Complete recovery in two months.

14. SOUTHAM. Med. Chron. Manchester, 1892, vol. xvii, p. 230. *Cause.* Retroversion (?). (Patient wore a pessary because of bearing down pains.) Probably infection. *Struct. of exfol. memb.* Mucous, submucous, and in places parts of the muscular coat. No mention of pregnancy, symptoms of cystitis five weeks, on entrance to hospital incontinence, foul urine. Treatment, irrigations, no improvement, patient passed membrane 4 weeks after entrance. Complete recovery in six weeks.

15. BEGOUIN. Arch. Cliniques de Bordeaux, 1892, vol. i, p. 479. *Cause.* Intravesical injection of sat. sol. of sod. chlor. *Struct. of exfol. memb.* Submucous and muscular coats. By mistake the patient injected sat. salt sol. into the bladder to produce an abortion at 5 months, immediately great pain and tenesmus which continued more or less till membranous cast was passed 30 days later. Result, almost complete incontinence. Nephritis. Pregnancy went on to seven months.

16. ORLOWSKI. Cent. f. Chir., Leipz., 1888, xv, p. 855. *Cause.* Followed a severe attack of dysentery. *Struct. of exfol. memb.* Gangrenous bladder mucosa. Girl, age 3. Attack of dysentery, improved in 8 days. Suddenly bloody foul urine, cleared up quickly, but returned in few days with retention. A small amount of foul urine with catheter, then after violent contraction of bladder a gray white slough appeared in catheter. On removal this was followed by a gush of purulent urine. Treatment, boric acid irrigation. Recovery.

17. KELLY. Kelly's Operative Gynecology, vol. i, p. 381. *Cause.* Overdistended bladder following ovariotomy. *Struct. of exfol. memb.* Portions of mucosa were cast off. Patient ran a high temperature, became insane, died in a year in an asylum from pulmonary tuberculosis.

18. RIBNIKAR (case 11). Inaugural Dissertation, Zurich, 1882. *Cause.* Retention after labor. *Struct. of exfol. memb. Autopsy.* Bladder gangrenous, extending into abdominal wall. Bladder mucosa separated. Age 36. Para 2, cystitis during pregnancy. Unsuccessful attempt to catheterize followed by incontinence. Death from a general sepsis in 6 weeks.

19. STOECKEL (case 1). Monatsber. Urol., Berlin, 1902, vii, p. 206. *Cause.* Retroflexed pregnant uterus. *Struct. of exfol. memb.* Membrane passed in shreds. Probably muscular coat destroyed. Patient was tamponed for bleeding during pregnancy. There was some injury to bladder as a vesicovaginal fistula resulted. This was unsuccessfully operated on. Result, incontinence.

20. STOECKEL (case 11). Monatsber. Urol., Berlin, 1902, vii, p. 206. *Cause.* Protracted labor. Forceps delivery at end of several days. *Struct. of exfol. memb.* "Complete cast of bladder." Muscular coat not injured. Five days after delivery incontinence for 4 weeks. Five weeks after delivery severe abdominal pain and gray sloughing membrane found protruding from urethra, which was removed. Frequency for a time. Complete recovery at end of one year and nine months.

21. GOTTBERG (case 1). (Werth.) Inaugural Dissertation, Kiel, 1892. *Cause.* Vaginal tumor, which proved to be bicornate uterus, with atresia and retained menstruation on left. Retention of urine. *Struct. of exfol. memb.* Large piece of membrane much disorganized, but containing elastic fibers. Three months later frequency every 15 to 30 minutes. Age 18. For 6 months urinary difficulties in connection with menstruation. Ten days before admission to hospital, complete retention, next day 2½ liters with catheter. Operated upon for hæmatometra, 200–300 cc. chocolate colored fluid removed. After operation bladder washed daily as urine was ammoniacal. 28 days after retention passed membrane.

22. GOTTBERG (case 11). (Werth.) Inaugural Dissertation, Kiel, 1892. *Cause.* Myoma of uterus, trauma, urinary retention. Membrane was a complete closed sac. Structure not given. Gray in color. Urinary salts on inside. Age 42. Symptoms of myoma. Thrown from sleigh, struck abdomen after which pain and retention, catheter could not be passed. 8 days later hæmaturia, followed by incontinence 7 weeks, urine foul. Membrane was passed, followed by 2d retention and incontinence for 14 weeks. Operation for fibroid successful. Result, day control, night incontinence.

23. VEIT (case 1). Samml. Klin. Vorts., Leipz., 1879, No. 170. *Cause.* Retroflexed pregnant uterus with retention. At autopsy large pieces of membrane (structure not given) found to have been cast off. Patient in asylum. Incontinence came on after attempt at suicide. Bladder enormously distended. The uterus had been replaced. Death from uræmia in two days.

24. VEIT (case 2). Samml. Klin. Vorts., Leipz., 1879, No. L70. *Cause.* Retroflexed pregnant uterus, 5 months' retention. Membrane passed in fragments. *Struct. of exfol. memb.* not given. Age 40. Frequent micturition, later incontinence, general condition poor. Bladder distended to umbilicus. Urine foul, 4 days after uterus had been replaced abortion. Later fragments of membrane passed. Incontinence 4 weeks. Frequency for some time. Final recovery.

25. HARTMANN. Bull. Soc. Anat. de Paris, 1888, lxiii, p. 516. *Cause.* Retroverted, gravid uterus, 4 months. (adherent) with retention. *Struct. of exfol. memb. Autopsy.* Membrane in bladder. Mucous membrane and part of muscular coat much altered. Patient 21, 3d pregnancy. Difficult micturition, sudden retention. Catheterized without precautions, large quantity urine. Catheterized next day, after which dribbling. 7 days later entered hospital. Large quantity foul urine drawn, urinary difficulty and retention continued. There was

an obstruction to catheterization, bladder could not be emptied. Attempt to replace uterus unsuccessful. Found adherent at autopsy. Death from septicæmia.

26. LOHLEIN. Zeitschr. f. Geburtsh. u. Gynak., 1888, xiv, 584. *Cause.* Torsion from a subserous myoma in fundus of uterus, causing change in circulation. *Struct. of exfol. memb. Autopsy.* A completely separated cast of bladder found with a dissecting hæmorrhage. Specimen from woman 36. Three days after operation for fibroid some incontinence. Fifth and 6th days hæmaturia. Urine foul, ammoniacal. Urine normal before operation. Partial separation was suspected because of difficulty in introducing irrigating catheter. Patient failed and died.

27. COCRAM. Med. News, 1893, vol. 63, p. 633. *Cause.* Tremendously overdistended bladder in a retroflexed, gravid uterus, 4 months. *Struct. of exfol. memb.* Entire mucous membrane of bladder, showing ureter orifices. Removed in two sections. Bladder distended to one inch of ensiform. Incontinence on exertion. Bladder emptied with catheter, urine bloody. In a week normal urination. Ten days later, T. 103. Abdominal tenderness. Tenesmus with bloody urine. Urethra was found blocked by sloughing tissue. Complete recovery.

28. ARROYO. Rev. Valenc. de Cien. Med., Valencia, 1904, vol. vi, No. 81, p. 203. *Cause.* Difficult labor with retention. *Struct. of exfol. memb.* not given. Large sloughing membrane and smaller pieces. Muscular coat probably badly damaged. Age 25. Primipara. Seen 18 days after confinement, had incontinence on motion from overflow bladder. Catheter 800 cc., foul urine. Became worse, taken to hospital 10 days later. Vesicovaginal fistula had developed which was dilated for drainage. Patient had passed pieces of tissue through fistula, which at times became blocked by membrane. One week after entrance, large piece removed. Patient was very ill with uræmic symptoms, Vesicovaginal fistula healed. There was a resulting ciactricial deformity of vagina which had been intensely inflamed and ulcerated. Recovery with incontinence. Capacity of bladder 30 cc., urethrovaginal fistula.

29. WARREN. Boston Med. and Surg. Jour., June 25, 1896. *Cause.* Dilatation of vagina for vaginismus. *Struct. of exfol. memb.* Mucous and submucous coats with some elastic fibers. Complete cast. Patient had had bladder symptoms for 6 months previous to operation. After leaving the hospital in 2 weeks, cystitis, much worse, 2 weeks later urine foul, alk. alb. blood, pus. Five days later symptoms of obstruction, foreign body protruding from meatus. There was moderate retroflexion. Complete recovery in about 2 years. 16 years later perfectly normal.

30. PRAEGER. Munch. Med. Woch., 1906, liii, p. 1275. *Cause.* Incarcerated uterus about 3 months. *Struct. of exfol. memb.* "Necrotic portion of bladder membrane." Patient miscarried, was curetted, bladder symptoms followed, passed calculi, had foul urine and incontinence. Digital exploration of bladder, many flat stones removed and a loose floating mass felt which on removal proved to be necrotic bladder membrane. Bladder capacity reduced. Incontinence at last note, 6 months after.

31. NORRIS. Am. Medicine, 1906, vol. xi, p. 475. *Cause.* Colon bacillus cystitis. *Struct. of exfol. memb.* "Cast of bladder." Age 32. No pregnancy, no retention. Symptoms of cystitis 8 weeks. Cystoscopy showed acute cystitis. Urine alk., cloudy. Colon bacillus pure culture. Improved in 2 weeks. Allowed to go home, to return for treatment, failed to do so. Returned in a week with a 14 hour retention and a sloughing mass protruding 4 inches out of meatus, which upon removal proved to be a cast of the bladder. Recovery.

32. ROBINSON. Albany Med. Annals, 1907, xxviii. p. 175. *Cause.* Cystitis(?). *Struct. of exfol. memb.* A flat piece of tissue consisting of epithelial elements only. Age 40. No pregnancy. Two previous attacks of cystitis. Recovery rapid under local treatment. Complete recovery.

33. O'NEIL. (case 1). *Cause.* Long, hard forceps delivery. Post-partum retention. *Struct. of exfol. memb.* "A large gray white spongy membrane." Patient had to be catheterized after delivery, symptoms of cystitis, two weeks after delivery dysuria and straining, something was noticed at meatus by nurse, next day yellow mass was larger. Expelled en masse on 3d day. Two years later, bladder capacity 2–3 oz. Incontinence on exertion. Improved under treatment. Capacity now 4 oz.

34. O'NEIL (case 2). *Cause.* Difficult forceps delivery. Post-partum retention. *Struct. of exfol. memb.* "Large sloughing membrane, size of the palm of the hand." Patient had to be catheterized for 3 days after delivery. this was followed by symptoms of cystitis and incontinence with foul urine. Three weeks after delivery sudden retention, a yellow sloughing mass was found protruding from meatus, removed by her physician. Nine months later, bladder capacity 3 oz. Can hold urine an hour sometimes, at times incontinence.

CASES OF EXFOLIATION OCCURRING IN MALES

1. Bosc. Bull. de la Soc. Anat. de Paris, 1827, vol. ii, p. 84. *Cause.* Retention. *Struct. of exfol. memb.* Thickened mucous membrane, found at autopsy almost detached. Age 72. Stricture, perineal fistulæ, intermittent retention, all urine passed by perineum. Three bladder perforations at autopsy.

2. BUCHANON. Brit. Med. Jour., Nov. 4, 1871, vol. xi, p. 520. *Cause.* Chronic cystitis. Prostate with infection (?). *Struct. of exfol. memb.* Said to have been mucous membrane entire. Recovery. Remarkable in that membrane was passed after great pain per urethra.

3. JACOBI. N. Y. Med. Jour., Sept., 1882, p. 304. *Cause.* Urinary symptoms of long duration. *Struct. of exfol. memb.* Mucous membrane found at autopsy entirely detached and filled with purulent urine. Age 66. Died with symptoms of septic cystitis. Bladder could not be emptied either by catheter or by aspiration.

4. SHRADY. N. Y. Med. Record, 1884, xxv, p. 79. *Cause.* Retention with extravasation. *Struct. of exfol. memb.* So necrotic examination negative. Membrane was passed through perineal section wound one month later. Urine had been foul. Dr. Shrady thinks it was an exudate. History, however, and length of time is very suggestive of exfoliation. Perfect recovery.

5. CLARKE. Trans. Path. Soc., London, 1888, vol. xxxix, p. 164. *Cause.* Retention three days. *Struct. of exfol. memb.* Autopsy. Partially detached mucous membrane in bladder. Top of bladder had sloughed through. Age 36. Bladder beyond umbilicus. Catheter passed. Bladder completely paralyzed. Perineal section, death from sepsis.

6. SOUTHAM. Med. Chron., Manchester, 1892, xvi. p. 230. *Cause.* Retention due to fracture 7th cerv. vert. *Struct. of exfol. memb. Autopsy.* A membrane consisting of mucous and submucous coats. Muscular coat was exposed on removal of membrane. Urine became

foul on 4th day in spite of precautions. Death in one month.

7. FENWICK. Tr. Med. Soc., London, 1893–4, xvii, p. 346. *Cause.* Bladder symptoms 25 years. No prostate, no stricture. Bacterial cystitis (?). *Struct. of exfol. memb.* Mucous membrane with muscular fibers on outside. Condition was found by exploratory perineal section for purulent cystitis. Recovery. Urinations every 1½ hours.

8. STEIN. Jour. Cut. and G. U. Diseases, N. Y., 1894, xii, p. 273. *Cause.* Probably lithiasis and infection. *Struct. of exfol. memb.* Portions of mucous and submucous coats had been passed by urethra. Death. No autopsy. Patient had had renal and vesical calculus.

9. DEAN. Practitioner, London, 1904, lxxii, p. 907. *Cause.* Retention two days, impacted ureteral calculus. *Struct. of exfol. memb.* Mucous, submucous, and muscular coats found at suprapubic operation. Stone removed from urethra, difficulty of emptying bladder continued for several days even with catheter. Patient passed on 3d day 95 oz. urine. Later showed signs of sepsis 18 days after retention, suprapubic operation, complete cast of bladder removed. Recovery. Capacity 5 ounces.

10. ESAU. Folia Urologica, 1907, p. 582. *Cause.* Post-operative retention. (Lap. for stenosis of pylorus in a prostatic.) Cystitis lighted up by use of catheter. *Struct. of exfol. memb.* So necrotic elements not made out. Cast of bladder including trigone and portion of one ureter. Difficulty of mic. before operation. Catheterized six days later, violent pain and tenesmus, urine foul. Constant drainage attempted, catheter continually being blocked by dirty gray looking tissue, on removing catheter piece of tissue found adherent. Ineffectual and painful attempts to empty overdistended bladder. Suprapubic cystotomy (lumbar anæsthesia). Necrotic cast of bladder removed. Recovery. Bladder capacity 100 cc.

11. DOLBEAU. Tr. Prac. de la pierre dans la vessie, p. 309, 1964. *Cause.* Vesical calculus. *Struct. of exfol. memb.* Fragment size 5 franc piece containing muscle fibers. 26 days after operation passed a membrane incrusted on one side. 39 days after operation almost all urine passed by perineum. Recovery.

12. DESCHAMPS (quoted by Dolbeau). Tr. Prac. de la dans la vessie, p. 312. *Cause.* Vesical calculus. *Struct. of exfol. memb.* "Considerable portion of internal lining of bladder." Stone was a large one. Urine became foul. Membrane was passed 37 days after operation. (By perineum?) Recovery with considerable loss of control.

13. FALKENBERG. Trans. Surg. Soc., Moscow, 1890, vol. ix, book 5, p. 378. *Cause.* Retention with extravasation. *Struct. of exfol. memb.* Membrane "looked like bladder." Recovery. Retention with sloughing of tissues of perineum, this area was drained and appeared to connect with the bladder, pus and foul urine obtained. On 19th day membrane was passed. No pathological examination, but probably true case. Perineal fistula, capacity 3 oz.

14. MARGULIES. Khirurgia, Moscow, 1904, vol. xv, p. 158. *Cause.* Retention(?). Infection. "Blood-vessels of submucous coat filled with lime salts. Probably of secondary origin." *Struct. of exfol. memb.* Mucous, submucous, and muscular coats. Removed at suprapubic operation. Patient went to bed well, awoke with tremendous desire to micturate, unable to do so at first, later passed urine and blood, after which tenesmus and passage of blood every few minutes, this continued 24 hours. After 6 days entered hospital, gradually improved. 8th day after admission a second similar attack and in 6 days more a third. Urine had become foul with cadaveric odor. Intense cystitis, catheterization unsuccessful. Suprapubic operation. Complete recovery. (This case is very completely reported, see text.)

15. SPECIMEN No. 4968 WARREN MUSEUM. Warren Museum, Harvard Med. School. *Struct. of exfol. memb. Autopsy.* Bladder wall thickened and trabeculated; mucous membrane, hæmorrhagic and gangrenous. On left is a large diverticulum containing a slough of its entire mucous membrane. Patient 35 years old, had had a foul cystitis for 6 months. Urine, blood, pus, and gangrenous detritus. Suprapubic operation for drainage. Death in a few hours.

16. TRONCHET. Med. Jour. Bordeaux, No. 23, 1884. *Cause.* Retention in a diabetic. *Struct. of exfol. memb. Autopsy.* Bladder enlarged, color dark, tissue friable. Surface covered with a soft, gangrenous looking membrane. Age 75. Polyuria, sugar present. Patient had stricture which contracted. Retention, difficulty in passing any instrument. In 6 days condition became grave. Death.

17. PEPIN. Thesis, Paris, 1893. *Cause.* Retention due to traumatic rupture of urethra. *Struct. of exfol. memb.* Autopsy. Fragments of membrane containing submucosa and part of muscularis. Bladder gangrenous with several perforations. Adhesions to abdominal wall, omentum, and intestines. Age 57. Traumatic rupture of the urethra, hæmaturia, and difficult micturition, followed by retention and perineal urinary abscess. This was opened, one liter of foul urine, retention continued; catheterization difficult; stream was continually blocked. Abdominal wall shows signs of infection. 48 days after injury and a month after opening abscess suprapubic operation was done; abdominal wall gangrenous, large pieces of membrane were washed out. Death in a week.

18. HAGNER. Read at the meeting of the Am. Urological Association, Atlantic City, June, 1909. Am. Urolog. Assoc. Trans., 1909. *Cause.* Enormous retention in a prostatic, infection. *Struct. of exfol. memb.* Large fragments of gangrenous mucous membrane passed after perineal section. Age 72. 5 years of urinary difficulty. Dribbling became constant. Acute retention relieved after 36 hours, 4 quarts urine drawn. In 24 hours, a second retention, this time urine foul. One week after first retention perineal section under cocaine; one week later perineal prostatectomy. Recovery.

CASES OF NECROSIS OF THE BLADDER

COLLECTED BY DR. F. W. N. HAULTAIN

(Reprinted from the Laboratory Reports of the Royal College of Physicians, Edinburgh, Vol. II, 1890, p. 216.)

CASES OF NECROSIS WITHOUT EXFOLIATION

1. DRAY. Med. and Phys. Journal, 1860, p. 456. Cause of death, peritonitis.

2. HAULTAIN. Case 2. (See reference at head of table.) Cause of death, uremia.

3. BAMBERGER. Thesis (prix Capuron), by Elleaume, Paris, 1860, p. 64. Cause of death, uremia. (?)

CASES OF NECROSIS OF BLADDER WITH PERFORATION

4. VAN DOEVEREN. Observat. Acad. Groningæ, 1765, p. 83. Perforation on 23d day.

5. HUNTER. Med. Observat. and Enquires, 1771, vol. iv, p. 58. Cause of death, perforation on 6th day.
6. LYNNE. Med. Observat. and Enquiries, 1771, vol. iv, p. 388. Cause of death, perforation on 15th day.
7. NAUMBURG. Stark's Archiv, 1796, vol. vi, p. 381. Cause of death, perforation on 28th day.
8. SAXTORPH. Gesammelte Abhandlungen, 1803, vol. i, p. 261. Cause of death, perforation on 21st day.
9. MOREAU. Archiv für Gynækologie, bd. xvi, p. 341. Cause of death, perforation on 50th day.
10. LITZMANN. Archiv für Gynækologie, bd. xvi, p. 341. Cause of death, perforation on 50th day.
11. SOUTHEY. Lancet, 1871, vol. i, p. 610. Cause of death, perforation on 18th day.
12. SCHWARZ. Centralblatt für Gynækologie, 1880, vol. vi. Cause of death, perforation on 37th day.
13. CRANINX. Traite pratique des Accouchements, 1838, p. 230. Cause of death, perforation in about 1 month.
14. VALENTA. Memorabilien, 1883. Cause of death, perforation on 15th day.

CASES WITH EXFOLIATION

15. TULPIUS. Observ. Medicæ, Lugduni Batavorum, 1716. Recovery.
16. MARTYN. Path. Trans., London, 1863, vol. xv, p. 137. Recovery.
17. WELLS. Path. Trans., London, 1863, vol. xv, p. 140. Death.
18. WELLS. Path. Trans., London, 1863, vol. xv, p. 140. Recovery.
19. WHITEHEAD. Brit. Med. Jour., vol. ii, 1871, p. 432. Recovery.
20. GODSON. Brit. Med. Jour., vol. ii, 1871, p. 432. Recovery.
21. BARNES. Med. Times, vol. i, 1861, p. 186. Recovery.
22. PHILLIPS. Brit. Med. Jour., 1871. Recovery.
23. WARDELL. Brit. Med. Jour., 1871. Recovery.
24. SCHATZ. Archiv für Gynækologie, vol. i, p. 469. Death.
25. MOLDENHAUER. Archiv für Gynækologie, vol. vi, p. 108. Death.
26. FRANKENHAUSER.* Archiv für Gynækologie, vol. vi, p. 77. Recovery.
27. LUSCHKA. Virchow's Archiv, 1854, p. 30. Death.
28. BRANDEIS. Archiv für Gynækologie, vol. vii. Recovery.
29. BELL. Edin. Med. Jour., 1875. Recovery.

* This case is reported again together with another case (see the writer's table No. 18) by Ribnikar in an Inaugural Dissertation, Zurich, 1882. It is remarkable in that the exfoliated membrane showed the presence of peritoneum.

30. MAUNDER. Med. Times and Gazette, vol. ii, 1863, p. 522. Recovery.
31. ZEITFUCHS. Siebold's J. für Geburtshulfe, 1833. Recovery.
32. WITTICH. Neue Zeitschrift für Geburt., vol. xxiii, p. 98, 1847. Recovery.
33. HAUSSMANN. Monatschrift für Geburt. 1868, vol. xxxi, p. 132. Recovery.
34. MADUROWICZ. Wiener med. Wochenschrift, 1877, Nos. 2 and 3. Recovery.
35. HURRY. Edin. Med. Jour., 1884, p. 1000. Recovery.
36. HEWITT. Obstet. Trans., London, 1883. Recovery.
37. AVELING. Obstet. Trans., London, 1883. Recovery.
38. PINARD. Annales de Gynecol. et d'Obstet., 1886. Death.
39. BOLDT. Am. Jour. of Obstetrics, 1888. Death.
40. HAULTAIN. Case 1. (See reference at head of table.) Recovery.
41. WALTERS. Obstet. Trans. Recovery.
42. BAYNHAM. Edin. Med. and Sur. Jour., 1830, vol. xxxiii, p. 156. Recovery.
43. LEVER. Guy's Hospital Rep., 1852. Recovery.
44. University College Spec. Museum University College, Spec. 1466. Recovery.
45. MAUER. Thesis, Berlin, 1881. Recovery.
46. DORAN. Obstet. Trans., London, 1881. Recovery.
47. RITTER. Vierteljahrschrift für Heilkunde, Prague, 1844, p. 37. Recovery.
48. KLEIM. Inaugural Dissertation, Berlin, 1880. Death.
49. LEMAIRE. Bull. Soc. Anatomique, 1863, p. 416. Death.
50. DUBARD. Bull. Soc. Anatomique, 1877, p. 291. Death.
51. ROSENPLANTER. Inaug. Dissertation, Dorpat. 1856. Recovery.
52. MAY. Inaug. Dissertation, Giessen, 1862. Death.

CASES WITH EXFOLIATION AND PERFORATION

53. KRUKENBERG. Archiv für Gynækologie, 1882. vol. xix. Death.

CASES OF NECROSIS OF THE BLADDER WITH EXFOLIATION IN MALES

54. LEE. Path. Trans., vol. xv, p. 136. Death.
55. WILKS. Path. Trans., London, vol. xv, p. 138. 1863. Death.
56. LISTON. Spec. 1933, Surgeons' Museum, London. Death.

DEPARTMENT OF TECHNIQUE

THE VALUE OF A SILK THREAD AS A GUIDE IN ESOPHAGEAL TECHNIQUE

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In a paper read before the New York Academy of Medicine in 1903, Dunham[1] presented a method of dilating cicatricial stenosis of the esophagus, which consisted in picking up a previously swallowed silk thread through a gastrostomy opening, and of using this thread to draw spindle-shaped sounds down through the stricture. While using Dunham's technique, Mixter[2] conceived the idea of using a silk thread, which had passed through the stomach into the intestine sufficiently far to permit of its being drawn taut as a guide for passing dilating sounds, thus, in most instances, doing away with the necessity of a gastrostomy.

The work of Mixter and Dunham has not attracted the attention which it deserves, comparatively few physicians being acquainted with this technique.

It is the purpose of this paper to again call attention to the value of a silk thread as a guide in dilating cicatricial stenosis and to report the more general use which I have made of it during the last five years in the study of about 300 lesions involving the esophagus. This group of cases includes 100 carcinomata, 65 diffuse dilatations associated with cardiospasm, 8 cicatricial stenoses at the cardia, and 7 diverticula.

In an attempt to develop a safe and systematic technique for the diagnosis and treatment of esophageal diseases, the silk thread in conjunction with skiagraphy, esophagoscopy, and the passing of sounds has proved of pre-eminent value. A complete exposition of the value of the silk thread in esophageal technique would necessitate a more lengthy discussion of the methods at our command than the limit of this paper will permit.

The patient slowly swallows six yards of buttonhole twist. This passes down through a sufficient number of coils of intestine to prevent its withdrawal on being pulled taut. It is advisable to have the patient swallow three yards during an afternoon, and the remaining three yards on the following day. The first portion forms a snarl in the esophagus or stomach, which passes out into the intestine during the night; the remaining portion follows, as a rule, without snarling. When the co-operation of the patient is wanting, as in infants, the thread can often be washed down through a stomach tube. I have met with but one failure to pass a thread through a cicatricial stenosis, though in a few cases much patient persistence was necessary. In my work the thread has been introduced over five hundred times, and not in a single instance has a symptom come up which would arouse the suspicion of harm from its presence in the intestinal canal. Not rarely, the thread will pass entirely through the gastrointestinal tract. A number of times, a heavy braided silk thread has been left in place for weeks. The olives are drilled from the tip to one side of the base for threading (Fig. 3).

In the introduction of esophageal instruments the thread has made possible adherence to the following rules:

1. The tip of the instrument must be constantly under the guidance of vision, or,

2. The instrument must follow a guide in such a way as to make perforation of the esophageal wall with its tip impossible.

The force required in introducing esophageal instruments is expended in overcoming the friction of the shaft on the walls of the passage, or it is dissipated at the tip of the instrument. A clear conception of the way in which the force is expended in the advancement of an esophageal instrument is essential to its safe introduction. While the element of friction is an important factor in the introduction of rigid staffs like the esophagoscope, it may for the present be disregarded. Under the term pocketing, for convenience, may be included all forms of obstruction to the introduction of a flexible sound other than that encountered when dilating a stenosed portion of the canal. Without going into the reasons, it

[1] Dunham. Vol. xxxvii, 1903, p. 350.
[2] Transactions of American Laryngological Society, 1909.

is sufficient for the present purpose to state that an unguided sound will, as a rule, be pocketed if an opportunity is present. When introduced on a taut thread, a sound follows the axis of the lumen of the esophagus. By varying the tension on the thread, obstruction from pocketing, and obstruction the result of actual narrowing of the canal may be distinguished. The elimination of pocketing permits a more accurate determination of the diameter of the lumen, and of the rigidity of the esophageal wall at the seat of narrowing. The thread avoids all prolonged searching with a sound and the rapidity and certainty with which the sound can be passed through the mouth, pharynx, and esophagus very much facilitates the management of children and nervous adults. Inability to differentiate obstruction from narrowing, and obstruction from pocketing, is responsible for the greater part of the reported mortality of from 10 to 15 per cent from perforation in cases of cicatricial stenosis, and the not infrequent deaths (not often reported) in cases of carcinoma and other esophageal lesions following the usual method of passing sounds.

Hardly more than an appreciable degree of force is permissible in advancing an unguided esophageal sound. With a silk thread that degree of force may be used which is short of carrying the thread out of its course through the esophageal wall, or of endangering the esophagus by longitudinal traction, or of splitting the esophagus by a dilating wedge. If sufficient obstruction is encountered to make it seem possible that the thread might be carried out of its course, a piano wire should first be passed on a thread, and the olive passed on the wire. The abruptness of the turns of a tortuous esophagus determines the size of wire which will most readily pass (No. 6 to 14 piano wire). With the wire in place the possibility of introducing the sound is assured. When passing an olive on the wire, tension on the thread should be maintained to avoid any possibility of the tip of the wire penetrating the wall of the stomach or esophagus.

In the treatment of cicatricial stenosis the wire guide is not often necessary after the first dilatation, and the thread may be dispensed with as soon as the smaller sizes of spindles will pass without encountering obstruction at the site of the stricture. Further dilatation is carried out with the sound shown in Fig. 4; the flexible spiral metal tip acts as a guide, and the stricture is dilated with the olive inserted in the staff. In those dense, extensive strictures in which sufficient dilatation cannot be obtained by dilating with a spindle, I resort to a modification of Dunham's esophagotome, which utilizes Dr. Abbe's principle of cutting partially through the distended stricture by a string pulled back and forth.

The marked distortion and dilatation (the result of traction and the strong propulsive force of the muscles of deglutition) in lesions of the upper three inches of the esophagus often renders the introduction of the sound or esophagoscope difficult. The thread entirely obviates pocketing of the sound and occasionally facilitates the introduction of the esophagoscope by guiding a flexible mandrin.

The conditions present in lesions at the cardia will be considered a little more in detail as they particularly well illustrate the service of the silk thread.

The thoracic portion of the esophagus is placed nearly in the median line, but deviates to the left as it passes forward to the opening in the diaphragm. In the dilatation of the esophagus accompanying spasmodic or organic stricture at or near the diaphragm, the right wall of the esophagus is displaced to the right, while there is relatively little displacement of the left wall to the left. As a result of this displacement the right posterior wall of the lower portion of the esophagus approaches a horizontal plane, or even dips below the level of the cardia. This is well illustrated in Figs. 1 and 2, radiographs taken in cases of diffuse dilatation of the esophagus. In passing an olive through the lower three inches of a normal esophagus, the staff impinges on the left anterior wall, and the olive is directed to the cardia by the left posterior wall. This portion of the esophageal wall presents an increasing degree of obstruction as it approaches a horizontal plane in cases of diffuse dilatation. The degree of obstruction encountered depends also on the stiffness of the staff, the size of the olive, and the tonicity of the esophageal wall. A stiff staff has a tendency to penetrate the esophageal wall (Fig. 5 A), while a relatively flexible staff conforms to the right posterior wall, and the olive approaches the opening in the diaphragm as shown in Fig. 5 B, that is, at an angle with the axis of this portion of the esophagus. In 35 cases of cardiospasm, a 15 mm. olive was passed without a guide, frequently without being able to locate the cardia. In 30 cases it was impossible to pass the cardia with a degree of force which the author considered safe. In but 5 cases was marked obstruction to the passage of an olive on a thread encountered. The facility with which an olive may be passed through the cardia in these cases depends more upon the access than upon the size of the lumen of the canal. This is illustrated by the difficulty experienced in

Fig. 1.

Fig. 2.

attempting to pass a proctoscope in an axis other than that at right angles to the sphincter muscle.

In addition to the points brought out above, the rigidity of the esophageal wall and the ledge (Fig. 6), formed by the upper margin of the growth, are important factors in passing a sound through a carcinomatous cardia. Crowding a sound over the ledge and through a cardia, the lumen of which is much larger than the olive, may give the impression of having passed a narrow stricture. The thread, by eliminating pocketing, permits of a more accurate determination of the diameter of the lumen, and of the rigidity of the esophageal wall at the seat of narrowing. The thread makes the dilatation of a carcinoma of the esophagus reasonably safe. No matter how much care is exercised, the attempt to pass an unguided sound through a carcinomatous stricture is apt to result in perforation. The usual seat of the perforation is at the juncture of the upper margin of the growth and the uninvolved esophageal wall.

There is a group of cases of carcinoma of the stomach in which obstruction to the passage of a sound is met just below the cardia. We have been able to make a comparatively early diagnosis of carcinoma in a number of these cases by the impression created when passing a sound on a thread. The sound is introduced until the obstruction is encountered, the tension on the thread is then varied so as to advance the sound along the upper surface of the obstructing mass. For this procedure a very small, flexible, whalebone staff and 15 mm. olive is used.

The conditions present in cicatricial stenosis at the cardia or the diaphragm level, make the introduction of a sound particularly difficult and hazard-

Fig. 3.

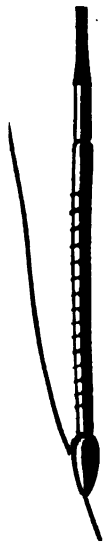


Fig. 4.

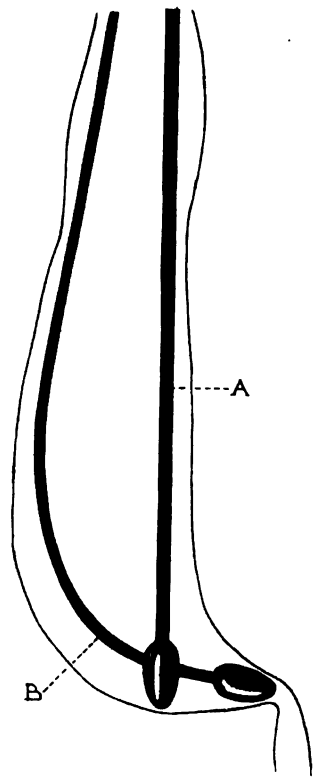


Fig. 5.

Fig. 6.

ous. The narrow tortuous lumen of the stricture lies at an angle with the right posterior wall of the dilated esophagus above, and the small sounds necessary to pass the stricture do not lessen the danger of perforation.

In a series of eight cases of cicatricial stenosis of the cardia, the result of simple ulcers or syphilis, the introduction of a sound was impossible. In three cases, after attempting to pass a very small sound on a thread, a wire guide was deemed necessary. It may be of interest to note that in these cases the sound was passed on the thread or wire through the esophagoscope.

My method of diagnosticating diverticula of the esophagus makes their recognition easy and, in some cases, gives information not easily obtained in any other way. The subjective symptoms in deepseated diverticula and cardiospastic dilatation of the esophagus are very similar and may be identical in some cases. The fundus of a deepseated diverticulum rests on or near the diaphragm, and a sound is obstructed at the same distance from the teeth as in diffuse dilatation. In either condition the sound, if repeatedly advanced and withdrawn, or inserted on different occasions, may at one time meet obstruction at the diaphragm level and at another time enter the stomach without giving any aid in the differential diagnosis.

As the neck of a diverticulum almost invariably lies in an axis with the upper portion of the esophagus, a sound will enter the diverticulum when introduced on a loose thread. When introduced on a taut thread, the sound readily enters the stomach. By first introducing the sound into the diverticulum until it is obstructed (Fig. 7) and then drawing the thread taut, the sound will be lifted out of the esophagus sufficiently far to bring the olive to a level with the opening into the distal portion of the esophagus. Until this point is reached, the sound cannot be advanced without relaxing the thread. With the olive at the level

of the opening into the esophagus (Fig. 8), and the thread drawn taut, the sound can be advanced into the stomach. This method of procedure is sufficient to demonstrate the existence of a diverticulum, to locate its point of origin and more dependent portion. Rumpel's test, or any of its modifications may be carried out in a similar manner with the added definite knowledge of the location of the point of the tube, and a certainty that it will enter the stomach.

Occasionally the thread is of value in following the course of a tortuous esophagus with the esophagoscope. To the experienced operator this is not of much advantage except in cases of congenital malformation, and in locating the slit-like opening into the distal portion of the esophagus in cases of diverticula. The thread is drawn up through the esophagoscope before its introduction. When drawn taut, the thread impinges on that margin of the distal opening of the esophagoscope toward the lumen of the esophagus. In direct gastroscopy, orientation is much facilitated in a similar way. The thread leads to the pylorus, and enables the operator to quickly place the relation of any portion of the stomach to that orifice. In mentioning this I do not wish to be interpreted as advocating gastroscopy in its present state of development.

The thread enables one to quickly and accurately place the hydrostatic dilator in cases of cardiospasm.

The forced feeding by means of a stomach tube introduced on a thread made possible a successful operation on a previously much emaciated case of diverticulum. The method has also proved of value in the study of stomach lesions associated with esophageal stenosis.

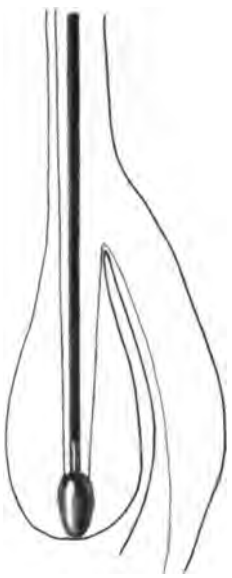


Fig. 7.

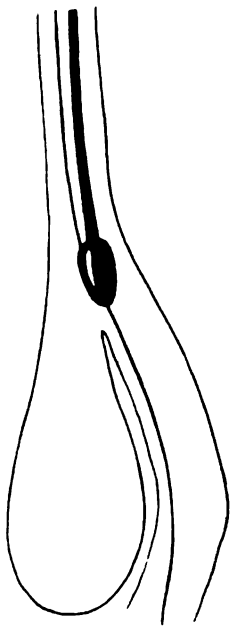


Fig. 8.

In a number of cases we have demonstrated the possibility of introducing stomach tubes, sounds, and even the hydrostatic dilator through the stomach into the duodenum. That this technique will ever find an important place in the study of the pylorus, duodenum, and pancreas is doubtful.

REMOVAL OF FOREIGN BODIES FROM THE BRONCHI

Gilt Upholstery Nail (No. 43) Removed from the Right Bronchus ("Low Tracheotomy and X-ray")

By FRANCIS HUBER, M. D., New York City, New York
Professor of Clinical Medicine, College of Physicians and Surgeons, Medical Department of Columbia University, New York; Visiting Physician Gouverneur Hospital; Attending Physician Beth Israel Hospital (Children's Ward)

Jacob M., nine years of age, nativity Russia, was admitted to the children's service, Beth Israel Hospital, February 22, 1910. Family history, negative. Personal history, surroundings poor. Diet, mixed. Bowels, regular. Urination, normal. With the exception of measles as a child, he had enjoyed fair health up to the present illness.

On February 21st, accompanied by his father, he presented himself for examination and admission to the hospital. He looked pale, worn with anxious expression, and somewhat emaciated. Questioning the father and the patient, the following rather indefinite history was elicited: For the past five weeks the boy had gradually lost flesh and strength. He suffered from fits of coughing attended with muco-purulent expectorations. There was occasional vomiting with the cough. No night sweats or hæmorrhage, not even a trace of blood in the sputum. Occasionally he complained of chilly feelings, but no fever, with the exception of three or four days, two days after the onset of his illness.

Appetite poor, pulse and temperature normal, physical examination revealed retraction of the infraclavicular region on the right side with diminished expansion. The right anterior aspect of the chest in fact is flattened. The deformity is of long standing, the result of rickets and nasal obstruction. On percussion marked dullness over second, third, and fourth interspaces anteriorly, apex not involved.

The breathing was diminished and on deep inspiration fine rales were heard over the dull area.

In view of the indefinite character of the history and the physical findings, Dr. Ginsburg, senior house physician and "Admitting" on that day, deemed it advisable to have the sputum examined for tubercle bacilli, and an X-ray examination made. The latter was in accordance with the rule established in the children's service, viz.: To have flouroscopic examinations made in all chest cases with *anomalous signs*.

The X-ray revealed a marked infiltration of the right upper lobe; in the midst of the inflamed area, apparently lodged in the right primary bronchus, a tack, three-quarters of an inch long, was detected.

In the light of these findings, a careful questioning elicited the following points: Five weeks before admission, the child accidentally swallowed a brass tack. Almost immediately he was taken with a severe coughing spell, which lasted for several minutes, the attack was not attended, however, with any evidence of asphyxia. The cough recurred at frequent intervals, the expectoration was muco-purulent, but at no time was there any streaking with blood. Two or three days after the accident, he developed a high temperature — 105—with dyspnœa and prostration. The marked constitutional symptoms subsided in about one week. The cough and malaise continued, in consequence the patient passed most of the time in bed. The appetite became impaired and bowels were constipated. No chills or sweats. He vomited a number of times, generally after coughing, occasionally after food or medication. Fearing punishment he had failed to tell his parents about the accident, nor did he say anything to Dr. Ginsburg, until told that a brass furniture tack was the cause of the trouble.

In reviewing the history of the case prior to the X-ray examination, we find as prominent features, a persistent cough, frequently followed by vomiting, loss of flesh and strength, with *anomalous* physical signs on the right side. Tuberculosis could be excluded because of the position and localized character of the consolidation and the absence of bacilli in the sputum. A localized empyema or unresolved pneumonia in the situation as found in our patient, must of necessity be due to some local exciting cause. In such cases the X-ray affords valuable assistance, not only as to the presence but also the exact location of a "suspected" foreign body, provided the latter throws a shadow.

In three cases personally observed, in which the object evidently was not impacted, the position of the patient would influence the symptoms in a striking and characteristic manner. Distressing cough and choking spell resulted when the patients were disturbed or placed on the unaffected side; relief was immediate when the original posture was resumed. It appears as though such children instinctively assume a position in which there is least disturbance of the foreign body.

The diagnosis of an unsuspected foreign body cannot be made at once; close observation extending over days, with a careful consideration of the symptoms and an X-ray examination, may be required. The physical signs vary at times in a deceptive manner. Thus in the case of Issie B., 3½ years of age, admitted December 31, 1908, the

Photo No. 1. X-ray picture showing tack and area of consolidated lung.

physical signs of an acute pneumonia disappeared over night. Further observation in the ward revealed frequent recurring attacks of vomiting preceded by a spasmodic cough, simulating pertussis without the "whoop." The attacks, it was further found, could be readily evoked when the patient was made to assume a certain position on the back. Breathing was feeble over the middle lobe with fine rales on deep inspiration. The first X-ray, negative. The value of repeated X-ray examination was shown by the finding of a foreign substance, probably a piece of match about one and a half inches long, in the right bronchus, in the second plate. Unfortunately, operative interference was refused.

The existence of a spasmodic cough attended by vomiting is suggestive, particularly so, if the spasms recur with greater frequency on assuming a certain position.

If the foreign body be movable, paroxysms of cough and dyspnœa of varying degree, are excited with change in position. The absence of such suffocative attack and the further fact that a change in position of the child did not lead to any reflex cough, justified the inference that the "tack" was probably imbedded, a suspicion verified at the time of its removal.

In the absence of a history of the entrance of a foreign body, suspicion may be aroused by anomalous symptoms. In children in particular, with unusual thoracic symptoms, the possibility of such an accident must be kept in mind.

In two cases of abscess and gangrene of the lung, the diagnosis of foreign bodies, confirmed by X-ray examination, was made by a process of elimination of other possible etiological factors. Many other points of interest might be referred to in this connection, but are omitted as they have already been discussed in a former paper (Arch. Ped., March, 1909).

On February 26th after consultation with Drs. Felix Cohn, Wolff Freudenthal, and Henry Mann Silver, to whom I herewith extend sincere thanks for the kind assistance and co-operation, it was decided to attempt the removal by superior bronchoscopy.

Anæsthol was administered by Dr. Horowitt, house physician; Dr. Freudenthal then resorted to bronchoscopy.

Fig. 2. X-ray picture taken about one week after operation, showing improvement in pulmonary condition. Patient on back, alligator forceps and nail placed over anterior surface illustrating relative position at time of operation.

Though the bronchoscope was readily passed, the amount of muco-pus and blood stained mucus proved an obstacle to a thorough examination of the deeper parts. As it was impossible to secure a clear field with the means at hand, and as the "secretion aspirator" failed to work, superior bronchoscopy was given up.

With the kind assistance of Dr. Silver, a low tracheotomy was performed. A moderate sized goiter with a large isthmus, necessitated a low incision in the trachea. The excessive secretion of mucus and blood prevented a successful attempt at inferior bronchoscopy as practiced in a former case. Several attempts with forceps passed blindly into the trachea were then made without success. The patient was now taken to the X-ray room and placed on his back on a wooden table, with the light underneath. After the tracheotomy tube was removed, a pair of alligator forceps, bent at an angle, were introduced into the trachea, and the fluoroscopic screen was placed in contact with the anterior aspect of the chest. The rays were then turned on. The shadows of the forceps and the tack were distinctly visible on the screen. After a few attempts the object was felt and readily seized at its point. Slight traction was required to free the head from its bed, its removal was accomplished without any further difficulty, though caught and held at the tracheal incision. The light was now turned on, and the extraction completed by retracting the cut tracheal rings. As the tack was being removed, it was interesting and instructive to follow the shadow of the moving picture on the fluoroscopic screen. The time of exposure to the rays, according to Dr. Hirsch, did not exceed two minutes.

The impression made on the spectator, as one of the gentlemen present remarked, as the tack was slowly withdrawn, was that of a small fish dangling at the end of a line.

The tracheotomy tube was again inserted, narcosis was discontinued, hot, wet compresses placed over the wound, and patient put to bed. The subsequent course was uneventful. The tracheotomy tube was dispensed with after 45 hours. Voice clear, breathing good, no evidences of laryngeal or tracheal irritation noted. The pulmonary signs began to improve rapidly. Temperature flat. Wound practically healed March 10, 1910.

To our skilled radiographer, Dr. I. S. Hirsch, I freely and cheerfully acknowledge my indebtedness and obligation for his courtesy and valuable assistance.

Fig. 3. Photograph showing position of patient, screen, and light under table.

Foreign bodies have been removed from the œsophagus under the guidance of the X-rays. A few such cases are recorded in recent literature. Last October, a drainage tube escaped into the pleural cavity, in a case of empyema. After several unsuccessful attempts with the finger and forceps, its removal was readily accomplished under the guidance of the X-ray. The suggestion to adopt this plan originated with Dr. Hirsch. The facility and ease with which the rubber tube was seized and removed, induced the writer to repeat the procedure in the present case, when, because of unforeseen exigencies, bronchoscopy was impracticable.

A word of caution may not be amiss. The possible danger of explosion, if ether be employed as an anæsthetic during the examination by the X-ray, should not be forgotten.

Krukenberg (Muench. Med. Wochenschrift, Jan. 25, 1910) reports a case, which might have been more serious in its results, in which ignition of the ether vapor was caused by the spark from the X-ray machine.

Once the trachea is opened, the forceps introduced, the screen applied to the chest and the rays turned on, the rest is simple. But one instrument is used, a pair of alligator forceps bent at an angle. There is no need of wiping away secretions to clear the field, nor is it necessary to resort to cocaine or adrenalin in the trachea or bronchi. Reflex spasm is controlled by general anæsthesia. The reaction is nil, even in the presence of a septic pneumonia as in our case.

The method commends itself because of its simplicity and ease of application. The case to be reported by Dr. Robt. T. Morris demonstrates conclusively that the necessary manipulations may be carried out, not only in the main branches, but also in the secondary ramifications.

PIN REMOVED FROM ASCENDING DIVISION OF LEFT BRONCHUS WITH AID OF FLUOROSCOPIC SCREEN[1]

By ROBERT T. MORRIS, M. D. New York City, New York
Professor of Surgery at the New York Post-Graduate Medical School and Hospital

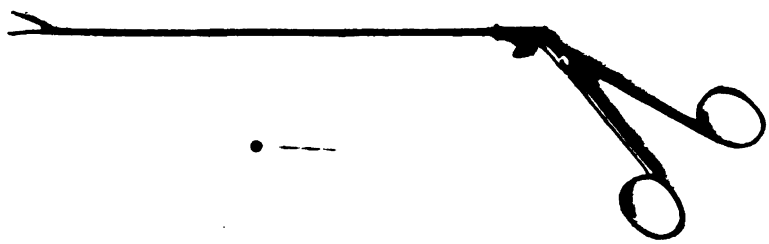
WHEN it was reported last month that Dr. Francis Huber of New York had used a fluoroscopic screen successfully as an aid in guiding forceps to an object in the bronchus, many of us no doubt awaited opportunity to verify the practicability of the procedure. The first suitable case coming under my care was sent by Dr. H. W. Fleck of Bridgeport, Conn.

Miss E. E. H., a young lady of fine physique, twenty-five years of age, five feet, five inches high and weighing one hundred and sixty pounds, had aspirated a veil pin about a month previously. The pin was of slender blued steel with an extremely sharp point, and black glass head. The patient states that immediately upon aspiration of the pin she felt it go to a point "back of the left breast," and she coughed violently and uncontrollably for an hour, until a Christian Science practitioner came to her aid, when she was able to stop the coughing. Subsequently she noted an occasional "rattling" in the vicinity of the pin, and was aware of its location. When she entered the Post-Graduate Hospital on March 11, 1910, I asked Dr. Arthur F. Chace to make a physical examination, and he reported that aside from a few localized mucous rales there was no evidence of change in the character of the tissues of the lung. Dr. Ludwig Kast examined the chest with the fluoroscopic screen, and found that the pin could be located without difficulty, the shadow lying beneath the fifth and seventh ribs as shown in the accompanying radiograph, which was made by Dr. F. H. Albee. Arrangements were made by Dr. Kast for placing the patient on her back upon a wooden table in the dark room, conveniently for conducting the operation beneath the fluoroscopic screen which was laid upon the patient's chest. On March

[1] A case reported at the Meeting of the Surgical Section of the New York Academy of Medicine, April 1, 1910.

Glass-headed veil pin in ascending division of left bronchus. Removed through a low tracheotomy incision by alligator forceps with the aid of the fluoroscopic screen. Patient returned home on fourth day. No complications.

14th the work was done. Chloroform anæsthesia was chosen in the belief that it would cause less bronchial irritation than ether, and this part of the work was assigned to Dr. I. J. Hoover of the hospital staff. One of my assistants, Dr. C. E. Hyde, asked if it would not be well to try an electro magnet. The answer was that an electro magnet would certainly have been at hand if the idea had occurred to me, but we were then about to proceed with the operation and it was too late. A low tracheotomy was performed. The trachea was exposed by using scissors opened repeatedly in situ, for the purpose of avoiding any hæmorrahge, and as close as possible to the sternal notch. The trachea having been exposed without hæmorrhage, two single hooks were inserted behind one of the rings, and the trachea brought forward and kept under control by Dr. W. S. Stucky, who had charge of the retractors throughout the operation. This proved to be an important step, and should not be forgotten by other operators, as the trachea is deeply situated at this point, and the small buttonhole through which the forceps were inserted would be obscured, if the opening in the trachea were not held close to the external incision. Dr. B. T. Davey assisted Dr. Kast in regulating the X-ray apparatus so that the screen could be used to advantage. When all was ready — the patient asleep, the tracheotomy done, and the screen placed in position on the patient's chest, I introduced through the buttonhole in the trachea, a long pair of alligator forceps of the sort commonly used with the bronchoscope. The forceps stopped first at the bifurcation of the trachea, at a distance of about three and one-half inches from the tracheal incision. Guided by the sense of touch, they were dislodged and carried into the left bronchus, through which they passed freely for about two inches. Again the forceps were arrested at a second bifurcation, and through the screen it was observed that the forceps at this point of arrest were one-third of an inch from the point of the pin, and the pin was evidently in an ascending division of the left bronchus. Quite a little manipulation was required, aided by the sense of touch, to pass this second bifurcation. The forceps then slipped ahead again for about an inch, and were seen to be alongside the pin. Dr. Kast used the diaphragm of the screen at this point for getting clear definition, and believes it to be an important feature of the work. Through the screen we could see the forceps opening and shutting upon the pin, but it did not respond to the first pull. The sharp point was evidently caught in the tissue. This was probably due to violent coughing when the pin was first aspirated, and the pin being caught at the point very likely allowed air to pass the head, so that atelectasis was avoided. Five or six times in succession the forceps slipped off from the pin, which could be felt as well as seen. Whenever



Alligator forceps and veil pin. (Case of Miss E. E. H.)

the forceps slipped off it required some little time to get gently by the bifurcation and alongside the pin again, as I felt that any considerable degree of force exerted at this point would result in puncturing the bronchus with the point of the forceps, and we would then be defeated, besides placing the patient in a position of danger. Realizing that the point of the pin must have been firmly imbedded in the tissues, I carried the whole pin a little farther into the bronchus, and then grasping it exactly by the point, withdrew it altogether without further difficulty. The pin had been at a position about six inches from the notch of the sternum, and evidently in one of the ascending divisions of the left bronchus, as indicated by the two turns necessary for getting clear of bifurcations, and also by the position of the pin, head up, as shown by the radiograph. It is probable that the bronchoscope could not have been employed successfully for a pin in this position.

It is also probable that an electro magnet would not have dislodged this particular pin, with its point already caught in the tissues, but in similar cases without lodgment of the point of an object, a long electro magnet is a resource to be thought of. The pin was slightly rusted. Its measurements were, diameter of shank of pin, one thirty-second of an inch; length over all, one and ten thirty-seconds inches; diameter of glass head, thirteen sixty-fourths of an inch. For another similar case I would have alligator forceps made without transverse serrations on the jaws. In this case the transverse serrations seemed to prevent the pin when grasped at an angle from turning freely, and swinging clear of obstructions. The small tracheal wound was not sutured. The rest of the wound in the neck was closed with a subcuticular suture of fine catgut, with the exception of a minute drainage point. It seemed best to make provision for a little drainage, because the patient had blown some bronchial mucus over the wound. The neck incision healed by primary union with moderate scar as you observe (patient exhibited). There was no reactionary inflammation of the lung of any consequence, and the patient returned to her home on the fourth day after the operation. She went under the anæsthetic smiling, came out smiling, admitted no sensation of nausea or pain, and attributed the absence of complications to her faith. The entire operation required thirty minutes. Part of this long time was consumed at the outset in waiting for coughing to subside when the forceps were first introduced into the trachea. The patient more deeply anæsthetized then stopped coughing altogether, and breathed smoothly and regularly throughout the rest of the operation. Most of the time was lost in getting the forceps past the second bifurcation each time they slipped from the pin, because of the necessity for patience in keeping all movements gentle in character.

When the bronchoscope was invented, and we were enabled to remove objects from the trachea and bronchi, a notable advance was made.

The case here presented demonstrates that with the aid of the fluoroscopic screen we can go still another step ahead, and remove objects from divisions of the bronchi. One may even conceive of cases in which objects casting no shadow may be made to become visible by impregnating them in situ with the salts of metals.

A fortunate part of the advance steps rests in the simplification of procedures, so that less and less skill is required, in the case here shown, almost no skill at all being required for removal of the pin.

SURGICAL KNOTS

By O. BORCHGREVINK, M. D., Christiania, Norway

THE efforts of modern surgery not only to diminish the operative dangers but also to reduce the importance of the operation, have created a series of technical improvements, of which the use of gloves is by no means the least. But with the gloved hand to tie a knot in the old fashion by rolling the thread between the thumb and the index finger meets with difficulty. To some men it has, therefore, seemed a necessity to look out for a new manner of tying, in which an extended thread is caught between two fingers, and slipped into the knot. In a word, a methodical tying of knots has by degrees begun to develop.

That this is a step forward is undeniable. During the tying the thread is caught in a precise way and the more or less accidental action of the fingers that occurs from lack of a definite tying technique is escaped, the tying of a "granny" knot becomes impossible. Another practical profit is, that all sorts of tying take place much more quickly.

That the cultivation of surgical tying is justifiable is scarcely to be disputed. But about the degree in which tying during an operation is desirable, opinions may differ. Some surgeons tie many knots, others make quite few. Some prefer a continued suture,others, among whom is the author, consider this in most respects inferior to the interrupted. The latter has at any rate the merit of favoring a discharge from the wound, which may be copious during the first 24 hours after the operation despite the most painstaking hæmostasis; evacuation is no doubt to be preferred to the more or less serious hæmatomata, which if there be an unsatisfactory outlet, form here and there in different depths of the wound.

But quite apart from suture it is a surgical virtue to embrace tying of knots with a certain amount of interest. The surgeon, who likes to tie knots places a ligature, where another simply removes the clips. And the hæmostasis can never become too scrupulous. Moreover it belongs to good surgical technique to tie one's knots both quickly and safely. Besides, this has an educational effect on the assistants and impresses the spectator. Not least in surgery, success depends upon detail.

The knots I here describe have been in use for many years. Some of them I have learned from others, two I have devised during my own work.

The one-handed knots are of special interest. They can be made with the left hand at the same time as the operator pulls the thread through the tissues with the needle in his other hand. Or one ligature after the other can be made with one end of a long catgut by the left hand while the coil is held in the right.

Among these the famous *Eiselsberg knot*,[1] as far as I know invented by Professor Eiselsberg of Vienna, is the most prominent.

Part i, step 1 (Fig. 1). Hold the left end of the thread between the third and fourth fingers, let the thread on its way towards the wound run across the hollow of the hand and over the back of the thumb and the index finger.

Part i, step 2 (Fig. 2). Pass the right part of the thread under the index finger, and obliquely across the pad of its tip. Pull the thread fairly tight.

Part i, step 3 (Fig. 3). Bend index finger in middle and terminal joints; the right hand part of the thread is then brought into the hollow of the hand and the back of the finger tip put under the left hand part of the thread between the thumb and middle finger.

Part i, step 4 (Fig. 4). Don't move the index

Fig. 1. Position to begin the Eiselsberg knot.

Fig. 2. Step 2 of Eiselsberg knot. The right hand part of the thread is passed under and across the index finger.

Fig. 3. Step 3 of Eiselsberg knot. The thread is brought by the index finger towards the hollow of the hand and under the other thread.

Fig. 4. Step 4 of Eiselsberg knot. The thumb grasps the left hand part of the thread on the index finger.

Fig. 5. Step 5 of Eiselsberg knot. The thumb and the index finger pull the short end of the thread through the loop and draw the knot tight.

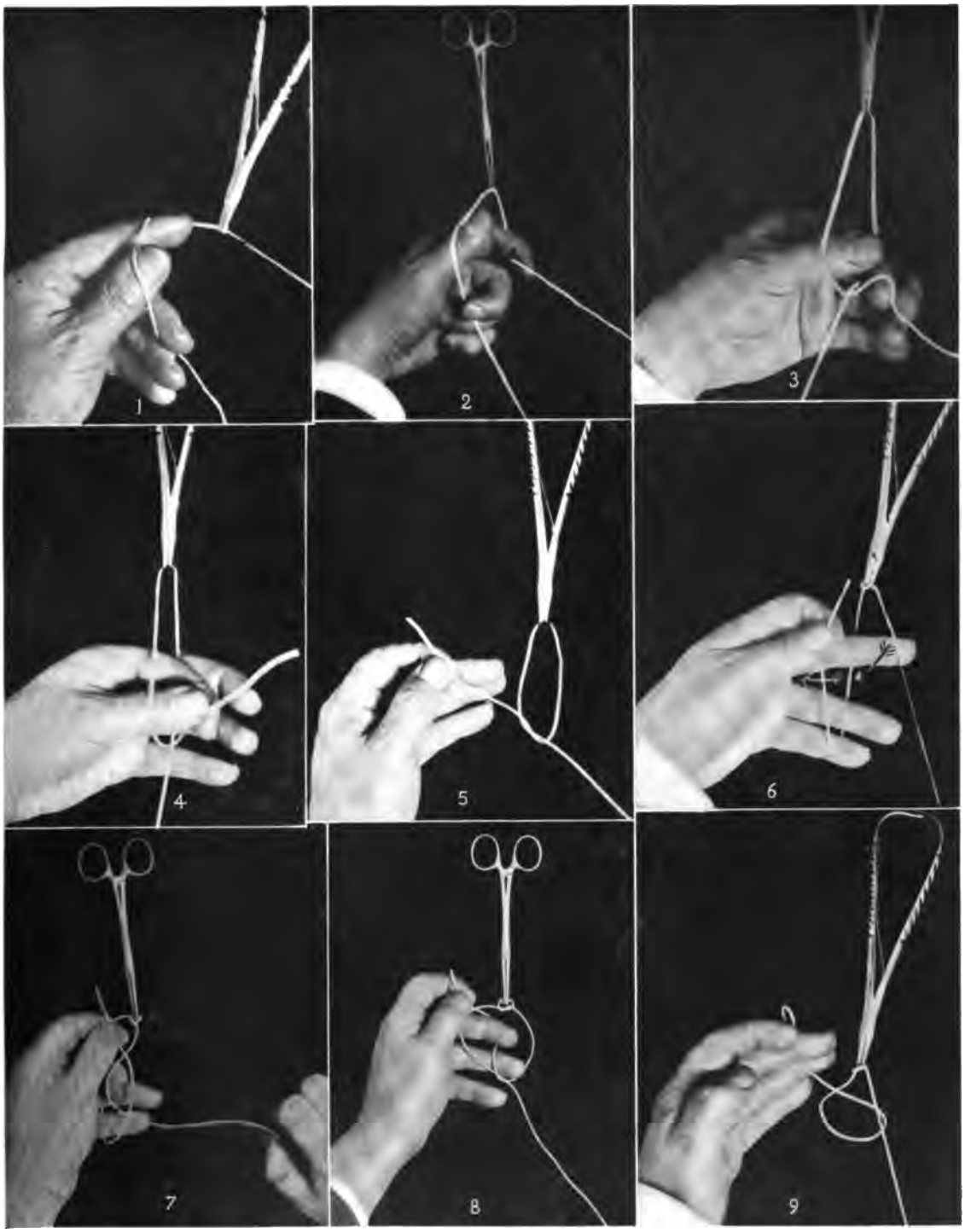
Fig. 6. Position for the beginning of part ii of Eiselsberg knot. The left hand thread runs in the figure over the little finger. It may instead run over the ring finger.

Fig. 7. Part ii, step 2, of Eiselsberg knot. Middle finger carries the long thread into the hollow of the hand past and under the short part.

Fig. 8. Part ii, step 3, of Eiselsberg knot. The short part of the thread is grasped between the middle and ring fingers.

Fig. 9. Part ii. Terminal step of Eiselsberg knot. The middle and ring fingers carry the thread through the loop and draw the second knot tight.

[1] Has been described in the Surgical Record, but without its name.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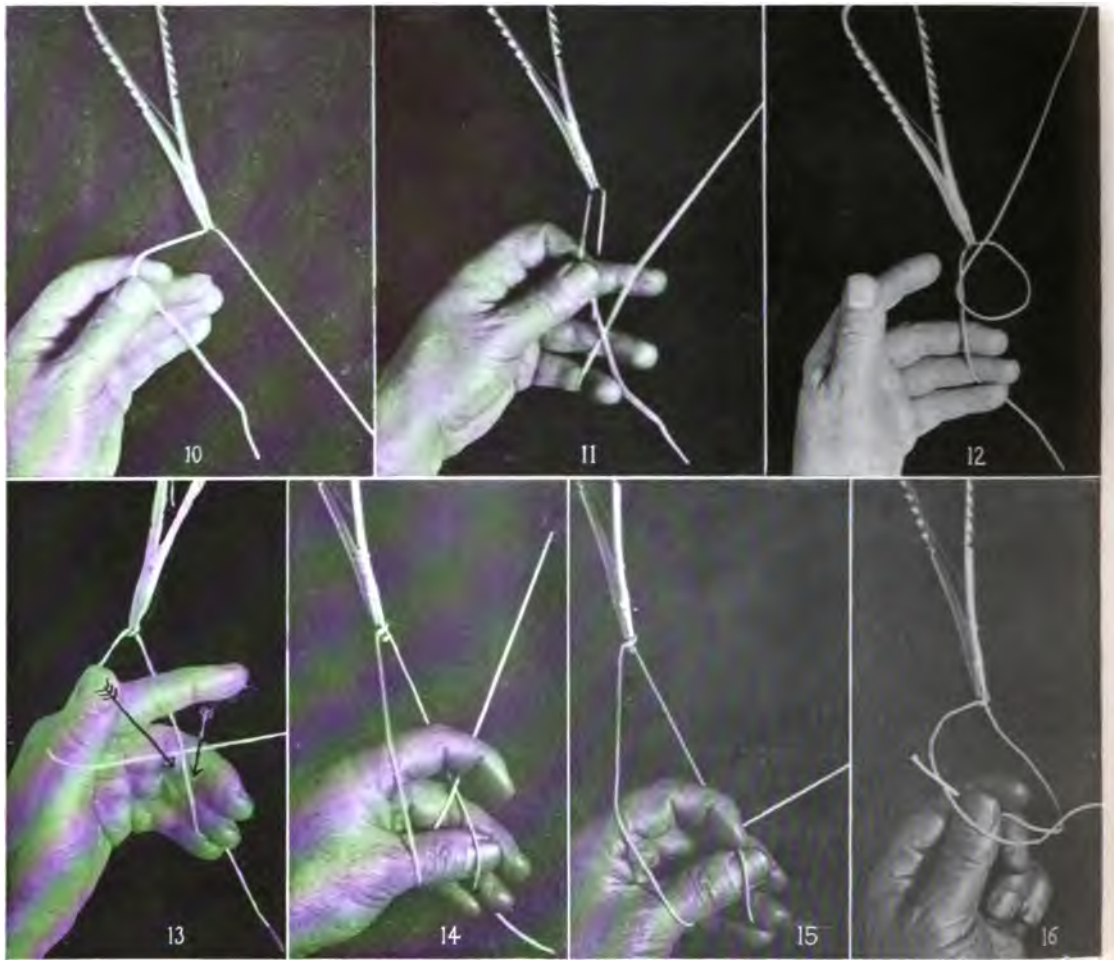

Fig. 10. Original position for the beginning of author's left hand knot.
Fig. 11. Second step of author's left hand knot. The position of the long thread and that in which the short end is placed by a twist of the hand.
Fig. 12. The short end of the thread is carried through the loop by ring and little fingers.
Fig. 13. Position for the beginning of second part of author's left hand knot.
Fig. 14. Part ii. Second step of author's left hand knot. The thumb is passed beneath the short end of the thread in the space between middle and ring fingers.
Fig. 15. The previous step continued. The short end of the thread on the thumb is grasped by the index finger.
Fig. 16. Terminal step of author's left hand knot. The short end is drawn through the loop with thumb and index fingers.

finger, the thumb is to do the work. Bend the thumb and grasp the left part of the thread on the index finger with it. When the thread is squeezed between thumb and index its end is let loose by the middle and ring finger.

Part i, step 5 (Fig. 5). Pull the left end of the thread through the loop that is formed, and draw the knot tightly.

Part ii, step 1 (Fig. 6). Hold the end of the left thread between thumb and index finger, let it run across the palmary surface and over the ring or the little finger on its way back to the knot.

The right thread meanwhile runs across the front of the middle finger.

Part ii, step 2 (Fig. 7). Middle finger moves alone, it bends and carries the right thread into the hollow of the hand past and under the left thread.

Part ii, step 3 (Fig. 8). With the back of middle

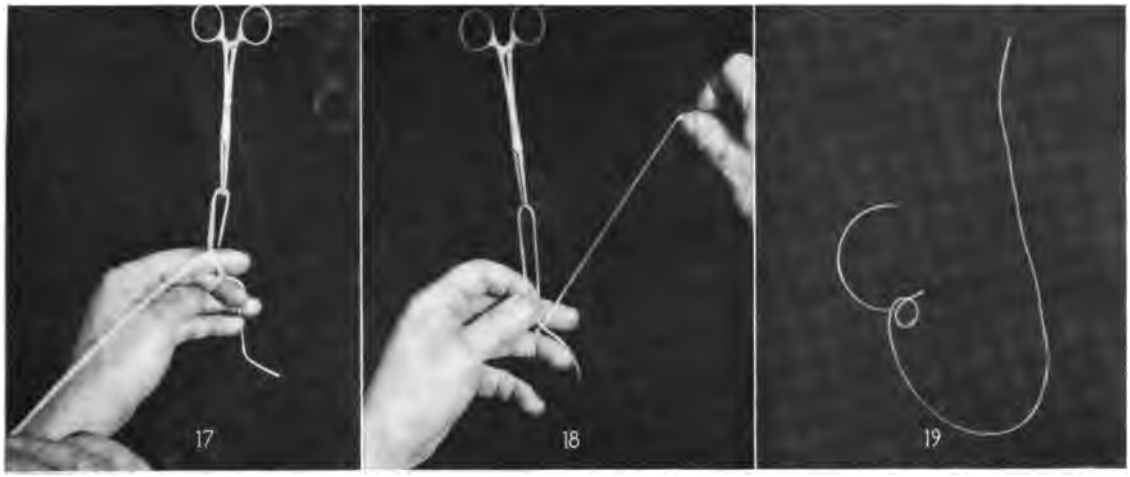

Fig. 17. Author's double knot. The short end of the thread is caught with index and middle fingers and for the second time drawn through the loop.

Fig. 18. Variation of author's knot. The long end of the thread is in the second step of part i, carried over the ring instead of over the little finger.

Fig. 19. Way of threading the gut through both eyes of a spring needle for author's left hand gut knot.

finger catch the left thread and grasp it between this and the ring finger.

Part ii, step 4 (Fig. 9). In this position (between middle and ring finger) the end of the thread is drawn through the loop and the second part of the knot tied.

The Eiselsberg knot can be tied very quickly. Its only weak point is that its first part requires considerable practice. Its second part is very easy and practical.

The author's left hand knot is to be used under the same circumstances as the Eiselsberg knot but is not meant to compete with it. My knot dates from my efforts to make the Eiselsberg knot after having seen it only from the spectators' gallery in the operating theatre. It proved useful, and as I had grown familiar and satisfied with it, I continued to employ it also after I had learnt to know the Eiselsberg knot.

Part i, step 1 (Fig. 10). Original position: Hold the left hand thread between thumb and index finger, and let the end hang down across the front of the other three fingers.

Part i, step 2 (Fig. 11). Carry the right thread down the back of the fingers, over the little finger and up again across the touching surface of fifth, fourth, and third fingers, distal to the left thread.

Throw the left thread across the right and catch it between ring and little finger.

Part i, step 2 (Fig. 12). With ring and little finger carry the left end through the loop which is formed and tie the first knot.

Part ii, step 1 (Fig. 13). Position: The right thread (the short end) is held between ring and little fingers and runs across the front of ring and middle fingers and under the index finger on its way to the knot. The left thread (the long end) runs across the back of index finger and thumb.

Part ii, step 2 (Figs. 14 and 15). With the long thread on the thumb and the index finger pass the thumb beneath the short end in the space between middle and ring fingers, grasping it between thumb and index finger. At the same time let the end between ring and little finger loose.

Part ii, step 3 (Fig. 16). Carry the short end through the loop with the thumb and the index finger and tie the second knot.

The first part of this knot seems to me simpler than the first part of the Eiselsberg knot, but the second part of the latter is no doubt more handy than the second part of mine. But the reason why I have continued to cultivate my knot and describe it here, is owing chiefly to the fact, that it has one advantage over the Eiselsberg knot, namely, that it is possible to make the first part a double knot.

In order to do this alter the third step of part i. When you have pulled the short end through the loop with the ring and little finger you put the index and the middle finger through the loop again (Fig. 17), catch the end of the thread, pull it once more through and draw the now double knot tight. For the second part of my double knot the second part of the Eiselsberg knot has to be employed. The thread is after the double knot exactly in the position of step i, part ii of the Eiselsberg knot.

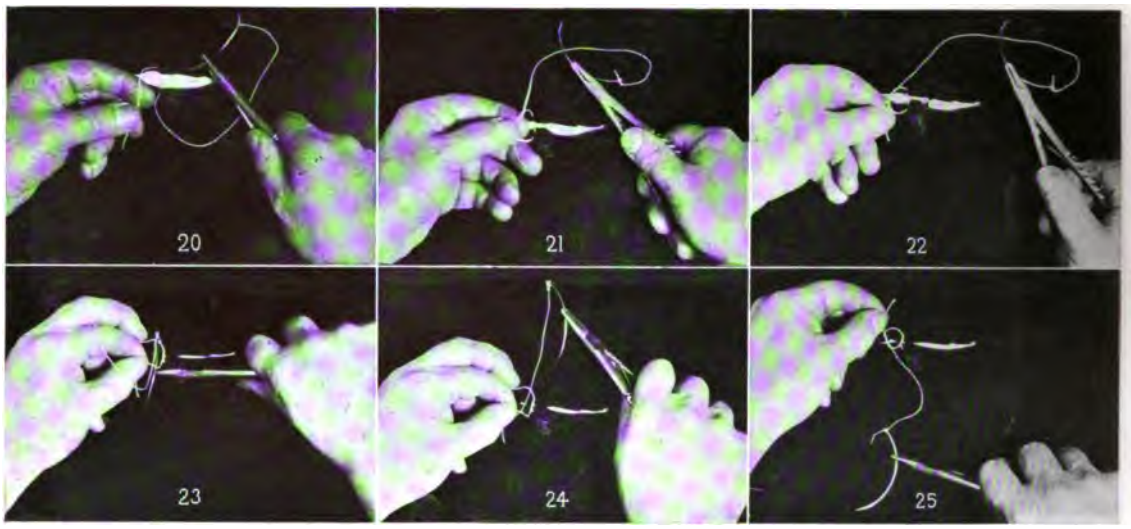

Fig. 20. How the short end of the gut is grasped to begin author's left hand gut knot, step 1.
Fig. 21. How the long end of the gut is placed between index and middle fingers.
Fig. 22. The short end of the gut is caught between thumb and index finger after having been brought through the loop by a twist of the hand.
Fig. 23. Part ii, step 1, of author's silkworm gut knot. The long end of the thread is grasped between the middle and the back of the index fingers. The needle is passed through the loop with eye end foremost.
Fig. 24. The needle is caught with the needle-holder on the distal side of the loop.
Fig. 25. The second knot is drawn tight by carrying the needle-holder back towards the operator.

By a variation, the first part of my single or double knot can be made still simpler and easier to manage. Instead of in step 2, part i, carrying the long thread round the little finger it is carried round the ring finger and the short end is caught by the middle and ring finger instead of by the ring and the little finger (Fig. 18). For the double knot the short end is caught and pulled through the loop for the second time with the thumb and index finger.

To make a series of interrupted knots with the same silkworm gut or horsehair I have for more than twenty years made use of a one-handed gut knot, which is tied with the left hand, while the right hand conducts the needle-holder and the needle. By practice it can be made very quickly, and it is moreover useful when suturing with no or little assistance.

To begin with, the gut has to be fastened to the needle. It is threaded through both the eyes of a spring needle, while the loop is laid in the cleft of the spring. Another condition is that the free end of the gut must be quite short, not more than about 1 cm. long (Fig. 19).

The silkworm gut knot. Part i, step 1 (Fig. 20). Carry the needle through the edges of the wound towards yourself, grasp the gut about 2 cm. from its end with thumb and middle finger, let it run over the tip of the index finger.

Part i, step 2 (Fig. 21). Bring the needle end of the gut in between index and middle finger.

Part i, step 3 (Fig. 22). Make a twist with these fingers and bring the end of the gut through the loop. Draw the knot tight with the thumb and the index finger.

Part ii, step 1 (Fig. 23). Pass the needle from you with its eye end foremost under the short end of the gut, which is held by the thumb and index finger. At the same time get hold of the loop between middle finger and the back of the index.

Part ii, step 2 (Fig. 24). Leave go the needle with the needle-holder and catch it again on the distal side of the loop, and pull it through.

Part ii, step 3 (Fig. 25). When the needle is through the loop, draw the second knot tight by carrying the needle-holder towards yourself. The gut must not be cut by the assistant, before the needle has got through both edges of the wound for the new suture. By the finished suture the edges are lifted in order to stretch and adapt them for the coming suture. For this knot a rather short and slightly curved needle is most suitable.

Of the two-handed knots there are a considerable number more or less rational. They can be varied

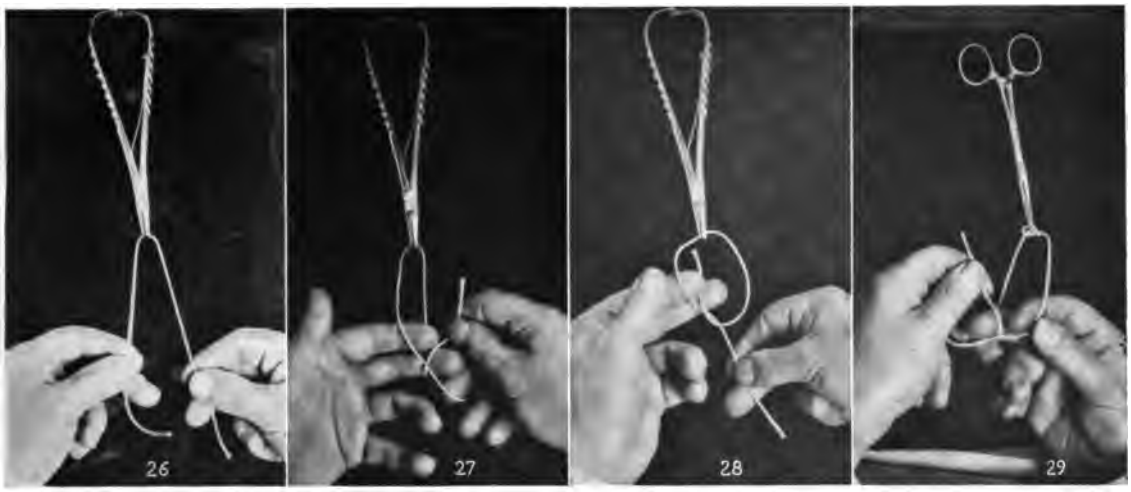

Fig. 26. Position for the beginning of the two-handed knot.
Fig. 27. Right hand thread is placed between left index and middle fingers. At the same time the left hand end is caught between right middle and ring fingers.
Fig. 28. Left index and middle fingers draw the right hand end through the loop and the first knot tight.
Fig. 29. Part ii, step 1, of the two-handed knot. Left hand end is placed between right index and middle fingers.

to much greater extent than the knots that are tied only with one hand. One of these knots may be quite as good as another, when the surgeon has become accustomed to it, and if it can be tied swiftly and safely. Nevertheless I describe the following knot, because it seems to me to surpass all others I have seen, in simplicity. This knot is undoubtedly of German origin, but I do not know the surgeon's name, which ought to be attached to it.

Two-handed knot. Part i, step 1 (Fig. 26). Hold both threads between the tips of the thumb and index and middle fingers. Both ends are in the hollow of each hand.

Part i, step 2 (Fig. 27). The right hand carries its thread over the left thread and in between index and middle fingers. During the same movement it catches the end of the left thread between the right middle and ring fingers.

Part i, step 3 (Fig. 28). Left hand pulls with index and middle fingers the end through the loop and draws the first knot tight.

Meanwhile right hand holds the thread in the original position.

Part ii, step 1. Both threads are held in the original position of step 1, part i.

Part ii, step 2 (Fig. 29). Left hand carries its thread over the loose end of the right thread and in between the right index and middle finger, while the end of the right hand thread is caught between left middle and ring finger.

The step is in every detail a recapitulation of step 2, part i, only with reversed hands. The next step is likewise a recapitulation of the corresponding step of part i.

As the free end of one thread is grasped during the same movement that places the other thread, each knot requires only one continued movement of the hands. The knot can, therefore, be tied with great rapidity and ease, and I doubt whether a better two-handed knot is to be found. A varia-

Fig. 30. Variation of two-handed knot. The ends are running from, instead of towards, the hollow of the hand.

tion of the same knot can be had by running the thread in the reverse direction across the index and middle finger tips (Fig. 30). This knot is to the beginner easier in tying, but it can not be carried out quite in the same dexterous manner.

There may be many other ways of tying a good surgical knot, and these knots may possibly be simplified and improved, but the interest many of my surgical confrères have taken in the methodical tying has made me publish these ways of tying, which to me, at least, have proved satisfactory.

AN IMPROVED METHOD OF MEASURING THE CAPACITY OF THE RENAL PELVIS

By HAROLD W. BAKER, M. D., Boston, Massachusetts
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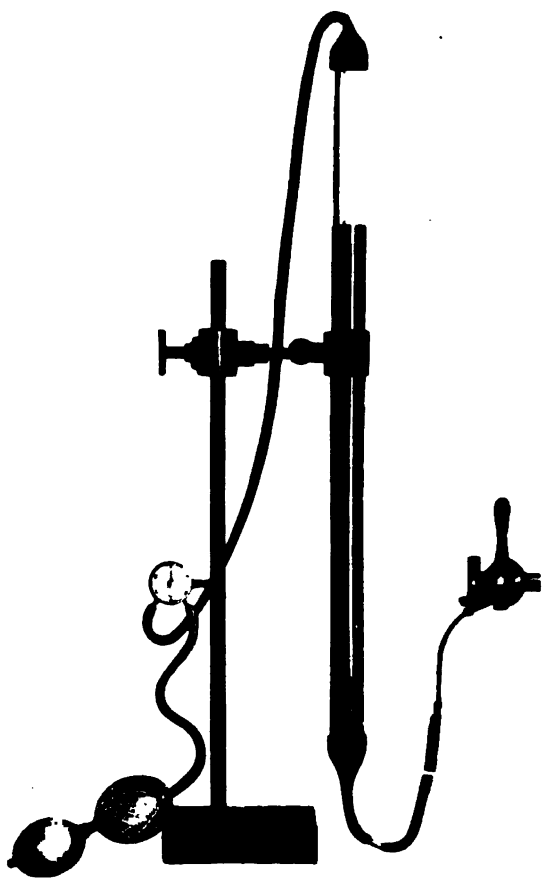
HAVING used the ordinary technique, so well described by Dr. F. W. Braasch[1] and Dr. Leonard Freeman,[2] for the purpose of measuring the capacity of the renal pelvis, I became dissatisfied with it for two reasons, namely: 1st. Because there was no gauge for the amount of pressure used in filling the renal pelvis, nor was there any standard for comparison. 2d. The forcing of the fluid through the catheter with a syringe is necessarily done with uneven pressure which tends to produce renal colic before the renal pelvis is filled. To obviate these faults and in order to standardize the pressure I have employed the following technique.

The apparatus, as shown in the figure, consists of a glass burette graduated into ccm. and of a 100 ccm. capacity. It is filled with sterile methylene blue solution, a rubber tube leads from the burette, which is fitted into the ureteral catheter by a glass connection, from the top of the burette a rubber tube leads to an air pressure gauge which is fitted with a cautery inflating bulb. With the ureteral catheter in the renal pelvis the bulb is inflated and the fluid is forced into the kidney pelvis under a uniform pressure. When the renal pain occurs, indicating that the kidney pelvis is distended, the reading of the pressure gauge is taken and the amount of fluid which has passed from the burette into the renal pelvis is seen at a glance.

I am indebted to my late friend and teacher, Dr. Melvin C. Millet, St. Mary's Hospital, Rochester, Minnesota, for the first suggestions which led to the construction of this apparatus.



[1] Surgery, Gynecology and Obstetrics, October, 1909.
[2] Surgery, Gynecology and Obstetrics, January, 1909.

TRANSACTIONS OF SOCIETIES

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING HELD FEBRUARY 18, 1910, WITH THE PRESIDENT, DR. CHARLES B. REED, IN THE CHAIR

HERBERT M. STOWE, M. D., EDITOR

I. PREGNANT CORNU OF THE UTERUS. II. MISSED ABORTION. III. LARGE FIBROID

BY LESTER E. FRANKENTHAL, M. D.

The first specimen I wish to show is a pregnant cornu of the uterus, which I removed from a woman who had not menstruated for a month and a half. She then started to have irregular hæmorrhages, and on palpation a mass could be felt. On opening the abdomen we exsected the mass and sewed up the body of the uterus as one would do in the extirpation of any tubal growth of the cornu. The corpus luteum in this case was on the side corresponding to the cornu. The uterine canal is preserved in this cornu. At least twenty-five similar cases are recorded in the literature, so that the transmigration of the fecundated egg is not necessary, and fecundation may occur on the side corresponding to the cornu. As in this particular instance, on account of the oviod shape of the uterus, the low implantation of the cornu, the origin of the round ligament, the diagnosis of a cornual pregnancy seems justified.

The second specimen is one of missed abortion. The patient menstruated last on June 10, 1909, and expected her confinement some time in March, 1910. On November 1st, I was asked to see her, on account of some bleeding from the vagina, and on careful examination I found that the uterus corresponded to about a fourteen or sixteen week pregnancy, although it should have corresponded to a twenty or twenty-two week pregnancy. Her husband had some nervous lesion — a paralysis — and I assumed that there might be some specific trouble, so I gave her large doses of iodide, and she stopped bleeding. I discharged her for the time being, and did not see her until a week ago, when she sent for me for final instructions for the approaching confinement, telling me that the baby was very lively. I examined her again bimanually and found that the uterus had grown smaller than it was when last the patient was seen. I felt satisfied that the child was dead. I did a tent dilatation and easily removed the secundines with the fœtus, well-preserved, of about the eighth week of pregnancy. The fingers and toes are not developed. The head corresponds to about half the length of the fœtus. The intestines still enter the upper part of the umbilical cord, so that this woman carried this fœtus in her uterus for twenty-seven to twenty-eight weeks after its death. It must have died when it was eight weeks old and is still quite well preserved.

The third specimen is a large fibroid of the uterus which reached to within an inch and a half of the xyphoid cartilage, one and one-half inch of the axillary line, down the same distance from the vulvar orifice. The pelvis was filled with the tumor and the cervix was situated high up under the symphysis pubis. The fundus of the uterus rested on top of the tumor. The difficulty in the removal of the tumor was the ureter. Luckily, being apprehensive of this, I looked for and found a white band, corresponding to the right innominate line, on the outer circumference of the tumor. Its growth was entirely subperitoneal. I was not certain that the band was the ureter, but I was careful of it, and after having extirpated the fibroid there lay in the bottom of the pelvis this white band filled with fluid. The patient had absolutely no disturbance from the bladder nor infection, and made an absolutely uneventful recovery.

Dr. Emil Ries presented:

1. Three cases of carcinoma of the body of the uterus.

2. Multiple fibroids (one of them necrotic) associated with bilateral ovarian carcinoma.
3. Case of carcinoma of cervix.
4. Two carcinomatous glands obtained in radical operations for carcinoma of the cervix, one from a case operated on nine years ago and alive and well to-day, the other gland from a case operated on recently.

THE LEGAL AND MORAL ASPECTS OF ABORTION

By MR. SIGMUND ZEISLER

I do not claim to be a specialist on abortion. I never defended anybody in a case of abortion. and I never had anything to do with abortion, actively or passively. But having been invited to talk to you on the legal and moral aspects of the question, I have given it a little thought, and crude though my ideas may be, you are welcome to them.

The common law, which I presume you understand is the law of England as it came to us with the colonists and as it was developed in the various states of the union other than through statutory enactment, is radically different from the statutory law. According to the common law, for instance, up to the time of the quickening of the child it was not criminal to produce an abortion with the consent of the mother. Even to produce a miscarriage under any circumstances prior to quickening of the child was merely a misdemeanor. The statutory law in all the states of the United States has made abortion or the causing of miscarriage of a pregnant woman in any stage, a crime. I will confine myself to a consideration of the provisions of the Illinois statute, which reads as follows:

3. *Producing.* Whoever, by means of any instrument, medicine, drug or other means whatever, causes any woman, pregnant with child, to abort or miscarry, or attempts to procure or produce an abortion or miscarriage, unless the same were done as necessary for the preservation of the mother's life, shall be imprisoned in the penitentiary not less than one year nor more than ten years; or if the death of the mother results therefrom, the person procuring or causing the abortion or miscarriage shall be guilty of murder.

4. *Ecbolic, or abortifacient drugs.* If any druggist, dealer in medicine, or other person, sells to any person any drug or medicine, known or presumed to be ecbolic or abortifacient, except upon the written prescription of some well known and respectable practicing physician, or keeps on hand, or advertises or exposes for sale, or sells any pills, powders, drugs or combination of drugs designed especially for the use of females, without keeping the certificate as required in the next succeeding section, he shall for each offense be fined not less than $50 nor more than $500, or be confined in the county jail not less than thirty days nor more than six months, or both. *Provided*: This section shall not be construed to apply to compounds known as "Official."

5. *Certificate required.* Before any pills, powders, drugs or combination of drugs designed expressly for the use of females, shall be kept or exposed for sale or sold, the proprietor thereof shall submit under oath a true statement of the formula by which the same is compounded, to five well known and respectable practicing physicians, in the county where the same is proposed to be sold, and shall procure their certificate, signed and verified by the affidavit of each of them, that such combination is not abortifacient; and every person keeping on hand, or in such manner advertising or exposing for sale or selling such combination, shall keep such certificate, or a sworn copy thereof, with the formula attached, for the inspection of any person desiring to see the same.

6. *Advertising abortifacient drugs.* Whoever advertises, prints, publishes, distributes or circulates, or causes to be advertised, printed, published, distributed or circulated any pamphlet, printed paper, book, newspaper, notice, advertisement or reference, containing words or language giving or conveying any notice, hints or reference to any person, or to the name of any person, real or fictitious, from whom, or to any place, house, shop or office where any poison, drug, mixture, preparation, medicine, or noxious thing, or any instrument or means whatever, or any advice, information, direction or knowledge may be obtained for the purpose of causing or procuring the miscarriage of any woman pregnant with child, shall be punished by imprisonment not exceeding three years, or fine not exceeding $1,000.

What interests us the most is the first section of the statute. It is short but pregnant with meaning. It hardly needs interpretation.

"Whoever." That is to say the means may be employed by anybody — not necessarily a physician.

The words "other means" are unimportant and without meaning. This phrase has been uniformly held to include only such means as fall within the same general class as the things specifically enumerated. The means used must be an instrument, or a medicine, or a drug. In other words, and there may be some defect in the statute in this regard, if a physician should advise a pregnant woman to ride in a poor kind of vehicle over a rough road for forty miles without stopping, with the idea that that would produce abortion, and with the intent that thereby an abortion should be produced, he would not be guilty of the crime of abortion under our statute.

The next clause in the statute is "causes any woman pregnant with child, etc.," in other words, there must be established a corpus delicti. There must be a pregnant woman, on whom somebody, by the means designated by the statute, produces an abortion or miscarriage. To you that seems quite natural, but not so to the lawyer. There are statutes in some states where there is no such provision as that the woman must be pregnant with child; it has been held that a man may be guilty of abortion or the attempt to commit abortion, if he believes that the woman is pregnant with child and does what he would do, if a woman were pregnant and he intended to produce an abortion. But under our statute, differing in that respect from the statutes of many other states, it is impossible for anyone to be guilty of abortion or the crime of attempting to commit abortion — and the punishment is the same in either case — unless the woman is pregnant.

Why say "to abort or miscarry?" Why this seeming tautology? There is meaning to this. Technically, a miscarriage exists when the fœtus is expelled during the first six weeks from the time of conception; the expulsion subsequent to that time is more technically designated as abortion. Under some statutes and under the common law the production of miscarriage, technically so-called. is not a crime, and it is required that a situation exist where abortion technically, so-called, is possible. In Illinois it would not make any difference how long the fœtus has existed or how much time has elapsed from the moment of conception to make the destruction of the fœtus and its expulsion the crime of abortion.

The next clause to be considered is, "unless the same were done as necessary for the preservation of the mother's life." This does not mean that anybody could produce an abortion and escape the consequences by saying he did it because it was necessary for the preservation of the life of the mother; but this much is true, that if a reputable physician, one not known to be an abortionist, should declare under oath that he gave medicine or performed an operation to save the mother's life, little question would arise but that his act was not a crime. But the presumption is that if anybody produces abortion it is not done for the purpose of preserving human life. Of course, ultimately this is a question that must be decided by the jury in every case from all the circumstances that surround the transaction. If, for instance, the abortion has been produced by a person who advertises that he can help women in trouble, one who has been caught previously in this nefarious business, or if, perhaps, in addition to that, the victim was known to be perfectly well, no amount of swearing on the part of the one who produced the abortion that it was necessary for the preservation of the mother's life would help him with the jury. He or she would be convicted.

In this connection, an astute mind might suggest that to prevent the suicide of the mother would justify abortion in the eyes of the law. Let us suppose an unmarried woman, insane with the fear of detection of her pregnancy, threatens to commit suicide. A kind-hearted physician or a professional abortionist other than a physician, takes pity on that woman and, to save her from committing suicide, produces an abortion. This would not be a defense. It can never be told whether a woman threatening to commit suicide will do so. The law is settled that to prevent a mother from committing suicide does not fall within the clause under consideration of this and similar statutes, by which it is provided that abortion is a crime, "unless the same were done as necessary for the preservation of the mother's life."

The balance of the statute simply provides the punishment.

It is a peculiar fact, worthy of notice, that in the limited number of cases that have gone to the supreme court of this state wherein persons convicted of this crime have sought a review of the conviction — I do not think there are more than a dozen such cases — the prosecution was almost always for murder and not for abortion. The victim died. Of course, we must not judge from this that death ensues in such an overwhelming majority of cases of abortion. What we should gather from this fact is that it is difficult to catch the fellows who are engaged in this abominable business, and that the authorities ordinarily do not wake up unless the victim dies. In reading the decision of the supreme court in the Hagenow case, we find that this woman had advertised in such respectable papers as the Chicago Daily News, the

Record-Herald and the Examiner for years. The advertisements could not be mistaken by anybody. It was perfectly plain what was meant. Still the authorities never went after the woman, although there is a statute which makes such advertising without any act done pursuant thereto, punishable with imprisonment up to three years.

One other thing should be noticed which is peculiar to most statutes; that is, that there must be an intent to commit abortion before any particular act can be held to be an abortion. For instance, suppose a brutal husband beats his wife and as the result of that beating she miscarries, he is guilty of assault, but not of abortion, because he did not intend that an abortion or miscarriage should ensue.

A few words more on the subject of attempt because that is significant and important. An attempt may fail, and still it is punishable under this statute and constitutes the crime of abortion just the same as a successful attempt. For instance, if a physician should advise a pregnant woman to take ergot in large doses and she, having a very strong constitution, would not miscarry, the man who gave this advice and induced the woman to take this drug is guilty of the crime of abortion. Of course, if some ignorant person should believe that Huyler's chocolates could produce abortion, and should advise a pregnant woman to take such, although he may intend to commit abortion thereby, still he would not be guilty, because there must be some aptitude of the means employed before a man can be guilty of the attempt to commit this crime. On the other hand, suppose a man solicits a pregnant woman to take an apt medicine for the purpose of producing abortion, though she does not do it, he is guilty of an attempt to produce abortion. He has gone as far as he can; if she has not taken the advice, having the means at hand, furnished by the adviser, the latter is guilty of abortion.

One more question of interest is, Is the mother who consents, guilty of abortion? I have carefully looked at all the decisions of the supreme court of Illinois to find any light on this subject, but have failed. The statute itself would exclude the woman from guilt though she consents. It says, "Whoever causes any woman, pregnant with child, to abort or miscarry." This language does not fit the case of a woman consenting, because she would not "cause a woman pregnant with child to abort or miscarry." But we have in this state a very broad statute defining who shall be considered an accessory to a crime.

274. *Before the fact.* An accessory is he who stands by, and aids, abets or assists, or who, not being present, aiding, abetting or assisting, hath advised, encouraged, aided or abetted the perpetration of the crime. He who thus aids, abets, assists, advises or encourages, shall be considered as principal, and punished accordingly.

It is my judgment that a woman who consents and aids the abortionist in an abortion is an accessory, hence is guilty as a principal under our statute.

There is another statute under which a woman would become guilty, the statute of conspiracy, which provides that if two or more persons shall combine or conspire to do an illegal act, they shall be guilty of conspiracy. If a woman and a physician or an abortionist combine together for the purpose of producing a miscarriage on her, then they are guilty of conspiracy, she just as much he.

Of course, a person who furnishes medicine or an instrument to those who are engaged in this crime, knowing that the means will be used for that purpose, though he does not advise or in any other way have anything to do with the crime, is an accessory and under our statute is guilty as a principal.

A word as to the moral aspect. Whenever a moral question comes up for consideration, I always like to fall back on the old Kantian categorical imperative which is about as follows: "Always act thus that the motive underlying your actions may furnish the principle for a general law." Let us apply that to the abortionist or to the woman consenting to an abortion. If the motive or principle of their action were to underlie a general law on the subject, it would mean that everybody should commit abortion and every pregnant woman should allow or consent to an abortion. What then would become of this world? Somehow or other, we are egotistic enough to think that the solar system, or at least this planet, was made for the delectation of human beings. Whether we believe that or not, it so happens that the human race rules upon this planet. Human life, in spite of vicissitudes and many sad hours, is a very beautiful thing. For centuries man has worked to produce what we call civilization, although we have not reached what will ultimately be called civilization; we have only reached a certain degree of it. That the human race should disappear from this planet is a sad thing to contemplate. That anything should ever become a general practice which would result in the total annihilation of the human race, cannot be contemplated with any degree of ease of mind. Hence it is so self-evident that abortion is wrong, that it really needs no discussion from the moral point of view.

It is wrong also because it is a violent interference with a normal, natural physiological process, an interference which is fraught with danger to life, or at least to health. Anything of that sort deserves the condemnation of all right thinking people, and certainly deserves the condemnation of the law.

But there are still other reasons, and here we must distinguish between married and unmarried people. In the case of married people, if abortion were to be sanctioned, it would be an encouragement to race suicide. Race suicide is not only bad in itself, because it must ultimately lead to the depopulation of the earth, but it is wrong for other reasons. Encourage married women to kill off the fruit of the womb, encourage them not to have any children, and you will encourage them to lead a life given over to idleness and frivolities. At least in many cases women, instead of devoting themselves to the duties of motherhood, will be sitting in rocking-chairs, reading cheap novels, or going to pink teas and Kaffee Klatsches. I have the old-fashioned idea that no man's or woman's life is rounded out or becomes a complete thing, a thing beautiful to contemplate, until he or she has the responsibility for the bringing up of children, and unless he or she has the great satisfaction and delight of seeing the child they have cared for grow up and become a useful member of society. It is the only way for us to become altruists that comes easy and natural. Other forms of altruism are difficult. This is one that nature has provided and makes us better human beings.

In the case of unmarried people, to sanction abortion would be to encourage licentiousness and recklessness of conduct. Fear of detection through childbirth is most often the only deterrent. If the unmarried woman believes in free love, let her have the courage of her convictions and ignore the prejudices of the world. Let her go about carrying her head erect, proud of the condition she is in as the result of giving herself to the man she loves. If she does not believe in free love, if she has had sexual intercourse with the knowledge or feeling that it is wrong, why should she be given a chance to hide her wrong? The procreation of children out of wedlock is not a thing that agrees with our views of the needs of human society. It must not be encouraged. But the existence of the practice of abortion encourages unmarried people to indulge their passions. If pregnancy ensues, the producement of abortion is not always so easy or simple, and thus this condition results in bringing children into the world out of wedlock.

Of course, the stern attitude of society is a powerful aid to abortion. Many an innocent woman is taken advantage of by a designing man, is seduced and made pregnant. In many an unmarried woman the sexual passion is a pathologic condition. She is so constituted that she cannot help yield to the man she loves. Society anathematizes such women, and it is but natural that she should desire to obliterate the evidence of her so-called guilt. If I had my way about it, I would not have such a woman condemned. If I could do it, and others would help me, I would try to fight that prejudice which so generally and under all circumstances condemns an unmarried woman who gives herself to a man. And society is so hypocritical that we do not so much condemn the woman for yielding to a man as for the horrible crime of letting herself be found out. We ought to educate society not to cry anathema to every fallen woman, not to throw stones at them, and thus to drive them into the hands of the abortionist. We should rather inquire into the circumstances of each case, and extend indulgence, forgiveness, and helpfulness to every woman who deserves it. Unfortunately, the view of society at the present time is the reverse, and is largely responsible for the prevalence of abortion.

THE METHODS OF THE PROFESSIONAL ABORTIONIST

By RUDOLPH WIESER HOLMES, M. D.

In general it is possible to characterize the professional abortionist by the use of three words — criminality, knavery, and avarice. A man prompted to perform one transgression against the moral and civil law easily may take the downward course until his life is steeped in illegal practices. The perpetration of one criminal abortion makes the second offense less obnoxious to his ethical stamina. Fraud must be met by fraud, the rewards of crooked action must be obtained by preying upon the weaknesses of human nature, and truth must be met by perjury. So we see the man who commits an illegal abortion for some specious argument and consideration finds that he must continue his offenses, he finds soon that the rewards are uncertain, and too often inadequate to compensate for the risks at stake — as a result he feels compelled to force an excessive reward by intimidation, coercion, and even robbery. There may be professional abortionists who feel they are called to relieve the illegitimately pregnant, or the married woman who wishes to deny her maternity, and who believes they are right, and who honestly, according to their light, endeavor to treat their victims with consideration and without any underhanded methods of obtaining reward; but I have grave doubts of the actual existence of such. The career of the professional abortionist is so uncertain, the expenses incident to his practices so large, that he must make hay while the sun shines.

The criminality of the professional abortionist is not comprised in the production of illegal interruptions of pregnancy alone, but includes all machinations stimulated by his cupidity. In considering this topic, therefore, we naturally may view the question from two aspects, first, and really more important, the discussion of the frauds, chicanery, and thievery employed in obtaining a clientele and securing the rewards; secondly, the methods employed in the production of the felonious attack. The first is a discussion of warped character, the second, a consideration of obstetric surgery very badly done.

There are three kinds of abortionists: First, the young man who is inveigled into committing his first offenses in his pressing need of money, or prompted by the call of a friend in need; secondly, the physician who stands fairly well with a certain clientele, and who largely is engaged in ethical practice, but who systematically relieves his patients in order that he may hold his families; the third class comprises the professional abortionists, and is recruited by the other two, especially the second class. The discussion of the first two classes does not concern us here, but in every community there are no inconsiderable numbers who have such professional careers; they generally are members in good standing in their local and national societies; the members of the organization know of the facts by repute and actual knowledge, but are too weak-kneed to take aggressive action for their expulsion.

This is a period of trusts, not only in the commercial world, but also in the perpetration of crime; the trite old saw that "birds of a feather flock together" typified this long before a trust was known. Within the past months the daily press has repeatedly mentioned the panders' trust; so the abortionists likewise have their organization for offensive and defensive warfare. We have one very strong organization in those who formerly advertised extensively in the daily papers, and do so no more on account of the stop orders issued by the post-office department; a coterie of midwives also has its association for mutual protection; not all professional or quasi-professional abortionists are members of the guilds, but enough comprise the membership to give each a strong financial backing in cases of need. We have been informed that the legal department is strong; the members have full instruction covering the methods to be employed so incriminating evidence will not be forthcoming. They have ample defenses devised for every contingency; in the event of a prosecution the defense is ready to prove an alibi, to prove the circumstance that the statement was made before witnesses that the young woman had had an operation elsewhere, and that they had merely performed a life-saving operation, testimony is met by perjury, and too often attempts are made to influence the coroner's office, or that of the state's attorney. This influence includes that of the Masonic order, the churches, reputable men and women of every walk of life; for every exigency a rebuttal is at hand. That there is system in this is evident in that they have a headquarters which is under the direction of an efficient manager.

Until three years and more ago advertising in the daily papers was systematically carried on; some of the dailies merely printed the names, addresses, and office hours of the abortionists; others

hesitated not at giving glaring notices. Saturdays, generally, were devoted to giving display advertisements which all but announced in plain words that they were willing to perform abortions. This was done by extolling their expertness in treating female irregularities, that confinement cases were taken, and that infants were adopted. One of the papers had a solicitor out whose sole business was to look after this end of the advertising game; regularly each week he would visit the advertisers to collect the moneys due; he sought out men of shady reputations in order to secure their notices, pointed out how great was the gain, and how easily the wording could be couched to be intelligible, yet not legally obnoxious. Some years ago a detective was sent out to visit each of these advertisers; she stated she was in trouble, or at times that a friend was pregnant, and, having seen the advertisement came to see what could be done; and one only would not commit himself, and he did this because he had recently been fined, and was not looking for further trouble. It was on this evidence obtained by the Committee on Criminal Abortion of the Chicago Medical Society that prompted the post-office authorities to prohibit the use of the mails to the papers if they accepted further advertisements of this nature. The return must have been large, for some of these advertisers spend daily from twenty-five to one hundred dollars. The papers fully recognized these criminal advertisements for they charged an exorbitant rate, many times over current rate for classified space. One paper which voluntarily suppressed these notices admitted their one quarter or more of a column netted them a full $50,000 a year.

The fees of the abortionist depend upon what the market will bear. The midwife has a sliding scale from two dollars up; if the girl remains in the midwife's home it is twenty-five dollars; some few have more aristocratic quarters with a fee of seventy-five dollars and more for the operation and one week's board; thereafter, the charge is twenty-five dollars a week for board and nursing. Some of these fashionable places are conducted by midwives, or experienced if not trained nurses, and have a regularly appointed staff of physicians to do the work. Fees are almost invariably taken in advance, and then exorbitant charges are added for extras. Some of these establishments have very lucrative returns; the proprietor of one of them, for instance, informed our detective that she had to remove her telephone because so many applications came in that she had more work than she could attend to. Another establishment keeps a waiting list; some of the prospective patients remain in adjacent boarding houses for their turn.

One of the successful operators, at least as far as numbers of his victims are concerned, who is now doing time at one of our penitentiaries, robbed a girl of her jewelry; this is not of rare occurrence. Again, now and then reports would reach the committee of a young woman who would enter a maternity home; soon the people would hand out excessive sympathy, and by thus ingratiating themselves would get all the facts of the girl's downfall, her real name, the name of the young man. After the girl had gone, blackmailing letters would reach her — when she was mulcted to the limit, the attack would fall upon the young man; when both had been bled to the last extremity the letters would cease. The writer has in mind one girl, above the servant class, but who entered the family of a friend as a nurse girl with the past facts of her life made known, paid about five dollars a week for nearly a year as hush money. My friend took action when he learned of the facts, which caused an immediate discontinuation of the blackmail.

In another connection it has been stated that culpability lies not in the transgression but in the fault of discovery. This is the watchword of the abortionist. He secures his immunity from arrest by hedging himself about with safeguards. The cardinal principle of their action is never to perform an operation with witnesses present; her companion is rarely if ever allowed in the room; if discovery is made it is her word against his; if she dies he stands alone. A very popular way is for two or more operators to work in harmony; one will make all the arrangements for the procedure, and then when all is ready another will slip in and do the work. In Boston a coterie of some four or five abortionists adopted this method — the operator would enter the room masked. One of these men confided in a lawyer that he and his associates were doing something like eight hundred to a thousand a year. Some others may adopt the names of those who have retired in affluence, or by ill health or death no longer need the name. This is a very popular method, especially of the woman abortionist, physician, or midwife. In going down the street and viewing the names of two midwives at the same door or in the same window, you may be fairly morally certain that this plan is in vogue. To the knowledge of the writer only one operator used an assistant; he was a man nearly eighty years of age, who for years had suffered from an aggravated paralysis agitans; it was impossible for him to keep his hand steady enough to pass the sound into the uterus, so he had a young woman to do it for him; thereupon, catching the handle he gave the uterine

cavity a sort of vibratory massage, with such success that in 3,000 abortions he had never a failure. He met his Waterloo in his three thousand and first case — she died, and he went to the penitentiary.

In the course of the investigations of the Committee on Criminal Abortion occasional rumors of graft reached our ears. In particular one midwife complained bitterly of the drain upon her resources by the systematic grafting of public officials; how true this was is hard to determine, but from analogy with other crimes for revenue her statement probably was true; she naively added that the collector had been a friend indeed when troubles had come to her. Some years ago the Chicago papers mentioned the name of an official who was reputed to have grafted among the abortion midwives.

In connection with this woman's statement it is really remarkable the utter fearlessness with which some of the abortionists will discuss their willingness to commit illegal operations. One man discussed the question with a young man over the phone, quoted a price, named the place where the operation should be done. With hardly an exception the matter will be discussed in personal interviews with any and all who will apply; they will tell all about their methods, their successes with no failures. Some have talked with the detective of the necessity of being careful on account of the investigations going on under the auspices of the medical society, the deaths at the hands of others were commented upon; they would occasionally "knock" each other as some reputable physicians are prone to do.

We have another aspect of this question which is to the great discredit of the reputable medical profession; many of the abortionists, physicians, and midwives, have a working agreement with members of the profession, who perhaps do not do operations, except on special occasions, but who regularly assume charge of the patients after the abortion is in progress. Some of the abortionists never will see the patients after the operation; if things do not go well they either will pretend not to know anything of the party, or will refer the case to some man who will cover up the dirty work. If a death occurs and a trial is held, certain men, and well known men at that, will appear as expert witnesses, the only purpose of their presence is needlessly to befog the situation by specious argument, or even the expression of the most arrant ignorance, or tinctured with the rankest cupidity and perjury. We have in our society memberships men who are willing to demean themselves for tainted money obtained in this wise.

The methods of the production of abortions naturally follow the rules laid down in approved text-books on obstetrics for the induction of premature labor and therapeutic abortion. The method of Scheel, the rupture of the membranes, is the most popular of the physician abortionist. Some few will use a speculum, but generally the sound is passed in by guidance of the finger: the speculum is objectionable in that the hitting of the sound on the speculum creates a noise which informs the woman that instruments are used — the sound alone may be employed without her knowledge. Many disclaim the use of instruments. An essential part of the game is for the patient not to know the method employed.

Next in frequency is the passage of the catheter: this has its drawback in that the patient carries away with her the evidence which may be removed by some reputable physician.

The third method, largely restricted to the hands of the midwife, is the tent; this is not popular with the knowing ones on account of the risks of its falling into the hands of others.

The use of so-called abortifacients is generally restricted to the more ignorant midwives, who fear to use more overt method of attack; the sale of these drugs is very large. In one of the places much advertised in times past the detective found a room well stocked with boxes and bottles; in pill form the usual charge is two dollars, in liquid, reputed to be more potent, the drugs cost three dollars. Some years ago a young woman called upon me to find out if it were safe for her to go into a business of this nature which already had been established some long time. She stated the company, clear of all expenses, netted nearly a hundred dollars daily.

Many of the so-called bath parlors, hair dressing establishments, do a land office business by giving local electric treatments in the course of Turkish baths. I have in mind a number of these places where ladies are wont to congregate with each menstrual delay. Patients have told me that on taking the cure the attendant will question how long overdue they are. Some go for this avowed purpose, others have gone because they heard from friends the electric bath, locally applied, has hygienic virtues.

Irrespective of the method employed the one startling fact stands out that the professional abortionist is notoriously dirty in his work. No preliminary cleansing of the patient or the instruments is deemed necessary; sounds are taken surreptitiously from a hiding place, and passed home without regard to the risks of sepsis. This is explained on the ground that the illegal act must

be quickly consummated, to prepare the patient and the instrument takes time, and may give an observing woman the opportunity of seeing how the thing is done.

Now and then the post-mortem examinations conducted by the coroner's physician have revealed most revolting injuries of the parturient tract. It is beyond belief that anyone who has followed the career of a professional abortionist with the broad experience which some have had, should be so lacking in skill that he should rupture the vagina, make repeated perforations of the uterus, or to gouge out the entire thickness of the uterine wall for a considerable area. One physician, three times to the writer's knowledge, has produced such revolting injuries; on two occasions she brought down some feet of intestine through openings large enough to admit three or four fingers. At the trial for the third death she was given twenty years.

This paper covers superficially the topic under consideration; no one knows how many deaths have resulted from illegal operations. The 40 to 60 deaths reported each year must surely be but a fractional portion of all those who die with fictitious causes of death inscribed on the death certificate.

THE FORENSIC DIAGNOSIS OF CRIMINAL ABORTION

By MAXIMILIAN HERZOG, M. D.

We generally distinguish between abortion, which means the premature expulsion of the products of conception at a time when they are not yet viable, and premature delivery or *partus præmaturis*, which means the same occurrence at an advanced period of gestation when the fœtus is supposed to be viable after its entrance into the external world. We will not, in the following considerations, distinguish between these two varieties of premature expulsion of the embryo but will use the term abortion indiscriminately in its broadest sense, and it may here be stated that the statutory laws of the states of the Union and of European countries, as a rule, do not make any distinction as to the time of gestation when a criminal abortion was performed.

We speak of an abortion as spontaneous or accidental when it has been brought about by natural intrinsic or external accidental causes, while we speak of it as provoked or induced when it has been brought about by artificial means, employed with the object in view of a premature expulsion of the ovum and embryo. There are certain medically well-recognized indications which not only justify, but may imperatively demand the induction of premature labor. All other cases, however, where such medical indications are lacking, are looked upon by the law as criminal abortions.

The forensic diagnosis of criminal abortion has to establish two points: namely, that a gestation has been going on, and that it has been intentionally interrupted by means adapted or supposed to be adapted for this purpose. In our own country criminal abortion does rarely become the object of a forensic investigation unless the female upon whom such criminal abortion has been performed dies in consequence of it. But whether the object of a criminal abortion is alive or dead, the fact of the preceding pregnancy has to be established by objective findings and not by mere subjective statements, because these may be entirely unreliable; a woman may have some motives for simulating a previous pregnancy, or she may have been mistaken about her condition. It is a well known fact that cessation of the menses is not at all a reliable sign of pregnancy, but that a guilty conscience and purely nervous influences may be responsible for it. I have once had a chance to examine very carefully a case of this kind. A young unmarried woman, after having had intercourse with her lover, missed menstruation once. A few days after the expected flow did not appear, she took a large dose of arsenic in the form of rough-on-rats, either with the object of producing an abortion or with suicidal intent. She died from the poison within less than twenty-four hours after taking it. The coroner's physician not caring to make a post-mortem examination, I performed a partial autopsy and secured the internal genitalia. There was neither a fresh corpus luteum nor a corpus luteum verum present, the uterus was not enlarged or very insignificantly, the mucosa was not much thickened if at all, yet it presented in one place a hæmorrhagic spot which looked somewhat like the place of implantation of a very young ovum. However, a microscopic examination of the spot in serial sections and of several other places of the uterine and tubal mucosa showed that there was not the least evidence of a recent pregnancy, either uterine or ectoptic. If a careful microscopic examination of this case had not been made, it would not have been ascertained beyond a doubt that it was not at all one of an early preg-

nancy as supposed by the unfortunate young woman herself. Similar cases of missed menstruation and other signs of a supposed pregnancy in the undoubted absence of the latter have been reported by others; hence, it is to-day a principle of the law, not merely in suspected criminal abortions, but in other cases of forensic bearing, that a diagnosis of pregnancy to be fully accepted, has to be based on objective findings. In women suspected of having been recently pregnant and delivered, the objective diagnosis has to be made in the first place by a careful examination of the mammary glands, the abdomen, and the genitalia, but this is a subject to be discussed by the obstetrician and gynecologist, not by the pathologist. The latter may, in an unwilling witness, obtain some information of some value by a microscopic examination of the lochial discharges, which always shortly after delivery show numerous red blood corpuscles, some leucocytes, epithelia, and decidual cells, sometimes also fragments of degenerated villi. However, even this evidence is available only a short time after an abortion has occurred. When the latter has not led to a local or general infection or to any other more severe disturbance, and when the abortion has occurred in the earlier months of gestation, all objective signs will disappear within one or two weeks. When, however, the object of an abortion dies shortly after the latter has occurred, it is comparatively easy to establish the fact of the previous pregnancy interrupted by an abortion. But it is quite a different thing to establish that the woman came to her death in consequence of a criminal and not of a spontaneous or accidental abortion. According to the statistics of various observers, spontaneous abortion occurs in one out of every four to eight pregnant women, and these figures do, undoubtedly, not include the abortions in women during the first few weeks of pregnancy; and while criminal abortion is unfortunately very common and has been practiced extensively for many centuries among civilized as well as among uncivilized nations, it is generally only taken notice of among the former if it leads to a fatal issue. It is, therefore, impossible to give any reliable statistics but we must assume that it is much more common than it can be proven and that even of undoubted cases a very small proportion only are punished.

When an abortion is induced in a woman, not on account of well-recognized medical indications but for reasons which stamp it a criminal case, this is frequently done by incompetent persons, hastily and not in the most approved aseptic manner, safeguarding the best results as to the health and life of the woman; hence, even if a fatal infection does not occur, the products of the conception generally come away piecemeal, portions of the placenta remain behind and become the cause of long continued hæmorrhages. This induces the victims of these unskillful and criminal practices to call in skilled and reputable physicians, who even when an abortion is denied, will from objective, clinical indications, curette the uterus. I have examined hundreds of such specimens of curettage following abortion, and I have never failed to recognize the presence of villi, even if they were in an adavanced stage of degeneration. According to the common testimony of all who have seen much of this work, it is quite easy to diagnosticate a previous gestation interrupted by abortion, and we can, even from the finer details of the placental tissue draw some reliable conclusions as to the period at which gestation was interrupted. It is equally easy to diagnosticate a previous interrupted gestation from an autopsy combined with a microscopic examination taking in the whole thickness of the wall of the uterus, particularly at the original site of the placenta, which place is still recognizable a considerable time after the delivery, especially if infection has occurred, in consequence of which involution has been delayed. In making a diagnosis of recently interrupted pregnancy after a post-mortem examination, the size of the uterus and the size and character of the corpus luteum verum, combined with the microscopic examination, of the muscularis, the chorionic villi, and decidual tissue, will also enable us to draw quite reliable conclusions as to the period at which gestation was interrupted.

In the living, when parts of the embryo fall into the hands of the investigator, he is likewise often enabled, in spite of advanced degenerative changes, to fix approximately the age of the embryo from histologic details which may be still recognizable. However, it must be repeated that neither the macroscopic not the microscopic examination generally furnish evidence of the criminal character of an abortion. The latter, whether brought about by internal abortifacients, or by mechanical means, may take a course exactly like a spontaneous abortion, both may lead rapidly to a complete restitution or to a fatal septic infection. Both spontaneous and induced abortion may lead to a gradual expulsion of the products of conception with prolonged hæmorrhages, and the latter may appear in both types of abortion before the expulsion of the ovum begins, and both on the other hand, may lead to a complete expulsion of the ovum and the placenta at one time, not followed by any prolonged hæmorrhage.

While most criminal abortions which lead to a

fatal issue die of sepsis, spontaneous abortions may likewise take the same course and while there may be a strong suspicion from external circumstances in cases of abortion following sepsis, that they are due to criminal practices, this can only be proven objectively in a small proportion of cases. Haberda of Vienna reports in Schmidtmann's Handb. der Ger. Mediz., that he examined between 1895 and 1903, seventy-seven cases of fatal septic peritonitis, all of which were strongly suspected of following criminal abortion. He was able to prove this by objective findings in only nine cases. In one case there was found a perforating appendicitis; the etiology of the other cases could not be cleared up so that the criminal character of the abortions could be proved by objective findings.

In fifty-two cases of another series where there was strong suspicion of criminal abortion by the aid of mechanical means, the same author found injuries to the genitalia, including perforations, in twelve cases, in the remainder no such injuries were found, and the suspicion of mechanical interference in order to produce abortion could not be verified objectively. It is, of course, held that an abortion followed in a few days by a profound septic condition is generally mechanically induced, but this can, as a rule, not be proven, even if the sepsis has led to a fatal issue in a few days and when anatomical evidences of the mechanical interference could not have been effaced by degenerative changes. It is, however, considered an important point when it can be established by medical testimony that the symptoms of sepsis preceded the abortion. However, I am not inclined to attach too much significance to this observation. Septic microorganisms may have entered the body of a pregnant woman through the respiratory or intestinal tract, they may have been transported by the lymphatics or blood current to blood coagula in the corpus luteum, the placenta, or decidua, and may have multiplied in such a fertile, defenseless soil and this point may have become the starting point in the general sepsis, and have led to subsequent abortion without any mechanical interference in the internal genital organs having occurred.

It is now quite generally held that an abortion is rarely produced by the so-called medicinal or chemical abortifacients. If produced at all, it is simply part of a grave general intoxication. This leads to certain symptoms which may strongly suggest the particular abortifacient employed, which may also be recognized by the sense of smell, or in many cases by exact chemical tests. After the use of such abortifacients has been established, accidental poisoning must of course be excluded and the ulterior motive in their use must be shown. The steps in establishing a diagnosis of pregnancy and abortion are the same whether mechanical means or abortifacients have been employed.

We may summarize the forensic diagnosis of criminal abortion as far as it falls within the province of the pathologist as follows:

1. The diagnosis first has to establish that there has recently existed a pregnancy which has been interrupted by an abortion. This, as a rule, is a comparatively easy task, provided that the proper material — uterine curettings — can be obtained from the living or if we are dealing with a fatal case, that a proper post-mortem examination, both macroscopic and microscopic, is made. While ordinarily the microscopic examination of material from the living or dead, of tissues of the embryo, the placenta, the uterine wall, furnishes a picture easy to interpret, it may, if the degenerative processes are much advanced, occasionally tax the ingenuity of the expert student of the placenta. But this latter condition will not be frequently encountered; nor is the danger great to confound the products of a normal conception with a hydatid mole or a chorio-epithelioma malignum.

2. To establish from objective findings that an abortion has been due to mechanical means, criminally employed, is a difficult task, even in cases where a strong suspicion exists and where a fatal issue has been due to a fulminant sepsis.

3. When criminal abortion has been due to the internal use of so-called abortifacients, these may be identified by the train of toxic symptoms to which they give rise, and which will present themselves whether an abortion lead to a fatal issue or not. Most of these poisonous substances can also be identified by exact chemical tests.

4. There is no set of symptoms by which a spontaneous abortion can infallibly be distinguished from one following mechanical interference, though certain symptoms and sequelæ usually strongly point to the probability of mechanical criminal abortion.

DISCUSSION

DR. CHARLES S. BACON: It is very desirable for us to have the views of a jurist on this subject. I was particularly interested in Mr. Zeisler's discussion of the reasons for the laws against abortion. As I understand it, the laws are based on the recognition of the value of human life. Human life is something that must be preserved. But the question then arises, Why is there a distinction between fœtal life and post-natal life? In other words, Why is not feticide the same as murder,

and why should not the law recognize this by meting out the same punishment in both cases? It might be said that the law represents only the sentiment of the community and that, therefore, a law making feticide murder could not be passed, but why should we not strive for it just the same? It is a question whether it would not be more wholesome to have the law against feticide the same as against murder. If the reason for not having such a strict law as that is that it could not be enforced, the same reasoning would lead us back to the old common law. If it is better that we should strive for a law that can be enforced let us seek one that is not too strict.

The duties of the physician as a citizen in giving testimony in any case of abortion that may come under his notice are not clear to many. As a citizen, he should help to carry out the law. As a physician, the confidence of a patient is inviolable. I think it might be well to have the legal phases of our responsibility emphasized.

Another question that I would like to bring up is the one that concerned the limits of therapeutic abortion. According to the law, therapeutic abortion is recognized only when it is necessary to save the life of the mother. As a matter of fact, almost all therapeutic abortions are done to save the health of the mother. In the case of a woman with heart disease we would not expect that delivery would result in the death of the mother, but it would probably seriously injure her health. As I understand it, when we operate for any reason, except to save the mother's life, we are breaking the law. If it is right to operate for the purpose of preserving the life of the mother, it should also be right to operate to preserve her health, and the law should recognize that and not make us lawbreakers.

Dr. Rachelle S. Yarros: Apparently these things have existed for many generations. Morally, we have improved somewhat, yet we still have as many abortions performed as before. We also have disreputable men performing them, and we frequently have reputable men performing them. As long as the demand is present, the supply exists. It seems to me that, as rational people, we ought to face the situation and see whether there is not a solution of the problem, whether there is not something else we might do to solve the difficulty. We do not want to encourage illegitimacy, but as Mr. Zeisler said, we are frequently far too hard in some exceptional cases. I am glad he mentioned it. We, as physicians, ought to emphasize this point very often and see what can be done. I have often thought, when these cases have come to me, that instead of taking the woman and punishing her in every possible way as the responsible person, why not also punish the man? It is probably a hard burden for her — harder than she can carry. She is punished severely, and in many cases one finds that the man at the bottom is a greater sinner than is the girl, and is more responsible. Society should in some way make him responsible, at least to the extent of having him carry the burden after making him legally the father and forcing him to support the child. I am absolutely sure that if this were done many men would not be found in that position. Many women say that if they had a little support from the man they would not think of having an abortion performed. Can we not constitutionally, and with the highest morality, in definite cases make the father responsible for the sin just as much as the mother, and if the woman is responsible when she asks for an abortion, I think that if the man who has seduced the girl knows that she will either have an abortion, or, if not, she will suffer, he should be made responsible. I think the time is coming when women will hold men responsible. Education will help a great deal more than the law. Women have hitherto been extremely ignorant on the subject of sex. It has been considered necessary for modesty's sake to keep them ignorant. The result is that they are often misled. I believe that with proper education on the subject, showing women that they are in danger of becoming pregnant and that the inevitable abortion follows, they will control themselves. I also think that education of men is of as great value. If woman is the weaker, then why should the burden fall on her?

Dr. Effa V. Davis: I was glad to hear the lawyer's exposition of the law and his discussion of the moral side. But I notice that in all discussions of this subject so little attention is paid to the rights of the child. The child is the innocent party and therefore the more sinned against. We are born with two primal instincts, that of self-preservation and that of the preservation of the race. We find that self-preservation is carried out by altruism; altruism being the refinement of selfishness. People who come to us and beg us to kill their unborn children certainly have not the finer instincts that they should have or rather they have missed the higher point of altruistic reasoning. This subject is not discussed in public as it should be, nor has it been written about consistently. We must educate the public. People should be taught what is right and just about sexual relations by such scientific data as physicians long have had at hand, but have withheld. As we have talked so much about the illegitimate child and felt so keenly that it is wronged, why should we not from now on labor to make the illegitimate a legitimate

child by making its father its real father? I believe that a child born to healthy parents in the unmarried state should constitute a marriage.

DR. EFFIE LOBDELL: Mr. Zeisler struck the keynote when he spoke of the attitude of society toward the woman and his remarks are particularly worthy of note because of the fairness in dealing with the parties concerned. It seems to me, however, that a cure will only come about when it is considered from a strictly economic standpoint, i. e., when it affects the public financially as a problem, as to-day tuberculosis is being considered.

All over the city and country are little groups of women providing temporary homes for the care of their more unfortunate sisters. We take the perfectly normal woman, give her the best of care, and she produces a beautiful normal child, but it is a social and legal outcast. That is where our arguments are weak and everything done for its welfare seems to fail — because the law which construes the case does not hesitate to discriminate against it.

It appears that we have laws enough but they should be revised or interpreted differently so that an injustice shall not be done unfortunate women and their most unfortunate children.

Dr. Yarros, Dr. Davis, and myself feel the same on this question, because our work is along the same lines. There is a statute which aims to obtain some provisions for the child from its father, where the father can be designated, but it is an easy matter to shift responsibility. The law should be altered so that any or all persons contributing through immoral relations to the dependency of a woman should be compelled to care for her and her child later.

DR. RUDOLPH W. HOLMES: Some three or four years ago we had a case in the criminal court in which the defendant was accused of producing a criminal abortion. The assistant state's attorney told me that he had carefully looked through the records and had failed to find one conviction for the production of abortion. He also informed me that in Illinois, as in most states, the woman was not a fellow conspirator, nor in any manner was she an accessory — she was merely an attacked party. Some years ago, in Wisconsin, a woman went to the abortionist and had an illegal operation; on going home and informing her husband of the fact she aroused his just indignation and resentment. A suit for malpractice was begun. At the trial the defense of the abortionist was that she consented, and consenting thereto she was equally guilty. The case went to the state supreme court which sustained the ruling of the lower court that it was no defense that she had agreed to the illegal act, and that she was an innocently attacked party. This was a civil suit. The couple recovered $5,000 damages. The case was then taken to the criminal court where the physician was convicted of producing an abortion, on his own sworn statement in the civil suit.

MR. ZEISLER (closing the discussion on his part): Dr. Bacon mentioned it as a defect in the law that we have no provision against feticide. I do not recall that there is a definite provision in the criminal code of Illinois on that subject. I presume that the legislature has been under the impression that most feticides are coincident with the producing of abortion. Of course, there may be feticide other than in the shape of miscarriage. If I am not mistaken, the common law, which in the absence of statutory provision to the contrary, would still be in force, provides that a child en ventre sa mère, is capable of being appointed administrator or executor of an estate. It is recognized as a living human being after the quickening period, and the destruction of the fœtus in any way separate from abortion is, if not a crime, at least a misdemeanor. Under the common law it was a criminal act. I think that that is still so at the present time. If it is not, Dr. Bacon is right in stating that that is a defect in the law.

I presume that the preservation of health is closely associated with the preservation of life, and where a reputable physician will consider it necessary to produce a miscarriage in the interest of the health of the mother, I am inclined to think that the law would regard that as being in the interest of life, because if health is impaired, life itself is in danger. In other words, I do not regard it as a necessary element in the defense against abortion that there should be imminent danger of death. However, that also is only an impression of mine.

Every profession has its own code of ethics, and I would not presume to dictate to physicians what professional ethics makes it their duty to do under the circumstances, just as I would resent a physician who has not thoroughly considered the matter dictating to a lawyer what professional ethics demands of him. However, I do not believe that under any circumstances a physician should consider it his business to aid in the covering up of crime, if called as a witness in court. He should not attempt to invoke any so-called privilege, but should freely tell the truth.

Some one has said that the innocent child should be regarded as an important factor. I think I have not left that out of view in my discussion of this subject. It is the child that we do consider when we say that future generations must be pro-

vided for. Of course, that might be regarded as a statement of the importance to society of preserving human life. So far as the child is concerned, the fœtus has no feeling, it has no independent existence, it has no consciousness, and therefore it is to be regarded less as an individual against whom a sin can be committed than the object through which a sin is committed against society and the interests of the human race as a whole.

It is very true that the woman, according to our code of morality, is made to bear almost entirely the consequences of the illicit intercourse between man and woman. I regard that as a great reproach to our conventional morality and to the law, and the law is very deficient in that matter. If the man can be pointed out with any degree of certainty as being the father of the illegitimate child, there is a proceeding known as a bastardy proceeding through which he can be compelled to pay to the mother for the support of that child the princely sum of fifty dollars a year for nine years. If the law should say that it does not want to provide any support for the mother, or for the child through the father of the child, because thereby women will be deterred from having anything to do with men except in the married state, there might be logic in that, but the law does provide that the father of the illegitimate child may be made to pay some support. If so, why the ridiculous sum of fifty dollars a year for nine years, and no longer? Why not provide that the child shall be an heir of the father just the same as the child born in wedlock? Why not compel the father to support the child according to his means? If not to provide any support for the unfortunate woman will deter *her* from illicit intercourse, then to provide that the father must recognize the child and make it his heir may deter *him* from illicit intercourse, and I am heartily in favor that this latter view should prevail in the law.

DR. REED: What is the attitude of the legal profession toward the doctor as an informer or as an instigator of action in cases coming under his notice?

MR. ZEISLER: I do not know what your ethics are, but speaking from the standpoint of the needs and interests of society, I should say that the physician who obtains evidence in the course of his practice of the fact that an abortion has been committed should by all means place his information immediately in the possession of the state's attorney.

DR. HERZOG (closing the discussion): I do not think that there is any necessity to continue the discussion, as far as the pathology is concerned, but I do wish to say something about the legal points which have been mentioned.

Dr. Bacon suggests that we make abortion murder. Murder, of course, consists in the killing of a human being. To look on an embryo four weeks old as a human being, seems to be an exaggerated view. Again, the law allows murder only in the act of self-defense, whether against individuals or nations. If we make the crime of abortion murder, that would prohibit the performance of an abortion under any condition, and we would have to accept the standpoint of the Catholic Church, that a living child must not be killed, no matter what the circumstances may be. It appears to me that there are unsurmountable obstacles to be considered.

Dr. Bacon also brought out the point whether a physician who gains knowledge of an abortion having been performed, and, of course, he can only gain any reliable knowledge through his own practice, should report to the state's attorney. The German law places the physician in his relation to his patient in the same position as the confessor stands to his parishioner. Everything he learns is secret and the German law makes the woman just as responsible for the abortion, whether she does it alone, or whether she consults some one and has his or her assistance. She will be punishable under every condition. The woman herself is guilty of committing or permitting an abortion. How can any physician place a case before the state's attorney when he has the full confidence of his patient, and thereby places her in the position of a criminal? That is a point to be considered, and I have spoken of it before. In my opinion whatever is confided to a physician is not to be divulged in court under any circumstances. The relations of physician and patient ought to be those of absolute confidence.

Some of the ladies have talked very feelingly about the child. There is a way of doing away with illegitimate children; that is, of doing away with the stigma of illegitimacy. It is the plan which is prevalent in Japan. There, if a man becomes a father of an illegitimate child, he adopts the child under the general system of adopting children in Japan, and takes the woman into his own household. There are no illegitimate children in Japan, and there is no stigma connected with what we would call an illegitimate child. Any decent man who is the father of an illegitimate child, who has the feelings of a father, will, I am sure, take care of the child and of its mother. And those who will not take care of them from their own impulses ought to be compelled by law to do so.

CHICAGO SURGICAL SOCIETY

REGULAR MEETING HELD MARCH 4, 1910, WITH THE PRESIDENT, DR. ARTHUR DEAN BEVAN, IN THE CHAIR

ASSOCIATED PERIOSTEAL PROLIFERATION WITH DISTANT INFECTIONS

A CONTRIBUTION TO SURGICAL PATHOLOGY

BY ALLEN B. KANAVEL, M.D.

The condition shown by the X-ray plates which I here present to-night is in a way unique as far as I am aware. They are gathered from the collection of my cases of infections in the hand and other portions of the body, and seem to show a proliferation of periosteum with a deposition of salts sufficient to cast a shadow in other parts of the same hand, and also in certain cases, of the opposite hand, without any other known etiological factor except the presence of an infection of an individual finger or portion of the hand.

My attention was drawn to this pathological condition about three years ago, and since that time I have studied all my X-ray plates with great interest with the idea of either affirming or disproving this pathological sequence. Whether this condition is due to the resultant œdema or to the toxicity engendered and transferred along the nerve fibres or by other means, must be an open question. I had at first thought that it was due to the associated œdema but upon finding that the same evident proliferation appeared in the opposite hand, I have been unable to give any clear etiological relationship or pathological sequence which would bear scientific proof.

It will be seen that the cases in general present a proliferation of the periosteum of the phalanges much marked in one hand and less marked in the opposite hand. The metacarpal bones do not seem to be involved, but the irregularity of the periosteum in the phalanges in the infected cases as compared with the picture seen on the X-ray plates in which the photograph was taken for other conditions, is very evident and a distinct difference is seen.

The possibility of a syphilitic etiology was constantly borne in mind, and in all cases here presented, I think that factor can be eliminated. All the cases in which it is found have been those of acute infections with a staphylococcus, with the exception of the last case, in which a fascial tuberculosis was definitely proven by pathological examination, and a syphilitic etiology entirely eliminated.

The first patient was one with a tendon sheath infection of the index finger. This had persisted for some two months, one-half the time with a constant application of hot dressings, and when I saw the patient the distal phalanx had become necrotic. The tendon sheath was opened and the extremity of the finger amputated. This was followed by a slow subsidence of the œdema which was present.

The second patient was that of a tendon sheath infection of the ulnar and radial bursæ. Here the proliferation upon the other fingers of the hand as well as upon the opposite hand is well marked.

The third case is that of an infection of the middle finger, and here the involvement of the thumb, particularly the distal phalanx, is clearly seen. The other cases are also infections of various fingers. The last case I present, that of tuberculosis of the fascia of the middle finger, which extended for about one-half an inch into the palm, and was not as far as I could determine an involvement of the tendon sheath, shows marked proliferation from all the periosteum of the fingers of the same hand and a slight proliferation on those of the opposite hand. Why this should appear in an infection in which we always expect to find an atrophy rather than a hypertrophy of bone, is especially puzzling.

VEIN SUTURE

By H. M. RICHTER, M.D.

In regard to the subject of vein suturing a great deal has been done in the last few years and I have nothing new to offer, but rather wish to speak of some work that has been done by others and some I have carried out.

A few weeks ago Guthrie reported the use of human hair for suturing veins. A number of different methods have been used in the suturing of veins and among the simplest and at the same time the best are the various methods by ordinary straight cambric needle, with fine-sized silk. We had been using very fine sizes, size 3 O of the ordinary form of twisted silk and also in the form of untwisted strands. The silk has been used in various ways. Most of the writers on the subject have advised adding one of several different things that are a little out of the ordinary in the way of preparation of the material for suturing. For instance, in the matter of sterilization of the silk, it has been suggested that we sterilize the silk in oil in order to lessen the amount of traumatism, I suppose, to the intima of the vein and to lessen the likelihood of thrombosis around the silk where it necessarily punctures a vein. My vein work has been purely incidental to other work and was not carried out with the idea of doing vein work in itself. In my work I started in to use size 3 O silk, and the finest cambric needles which I could get, size 12. Sterlilizing in oil was a little difficult to carry out in connection with the laboratory work, and I soon found by boiling the silk in water, as I would for ordinary surgical purposes, I could get practical results, that is, the damage done to the intima and the danger from thrombosis seemed to be no greater by simply boiling the silk than by sterilizing in oil. I thread my needles, and baste them into a piece of gauze after the method W. S. Halsted has suggested for intestinal work.

Guthrie's suggestion to use human hair seems to me to be a good one. It seems to me that human hair, if strong enough, should do very well. It is very smooth. If you use straight hair — and even wavy hair is not objectionable — it can be threaded much more readily than silk in the fine needles that are necessarily used. So I started in to use this method. Guthrie in reporting the use of human hair advises the sterilization of the hair in oil, and in fact describes that method of sterilization. I began to use hair boiled in the ordinary manner in water and I find it can be boiled readily, and it will retain practically the same degree of strength after being boiled that it had beforehand.

As regards the strength of the suture material, we have always found that by a little care we can use any suture material that is of use in surgery. For instance, catgut, if we take care in using it, the strength of the material is no longer any great factor. We see men using size 3 and size 4 catgut, but most men to-day are not using that. Most men are able to get along with fine catgut and get all the strength out of it they want. When a strand of catgut gives way it is the manner in which it is knotted rather than the weakness of the catgut. In using human hair, which has previously been boiled in water and threaded in a piece of gauze, as we do with intestinal sutures, I have employed it a number of times in vein work and in order to test its strength in doing some intestinal and stomach work in making an extra stomach pouch, I have used human hair and find it to be very strong. I have not broken human hair in any work I have done.

As to the objections to the use of human hair, the first was that the size of the needle was such as possibly to leave an opening that the hair would not fill. By the hair not filling the opening there might result leakage which in vein or vessel work would be bad. Practically, by using size 12 needle, I found that objection did not hold. There is no leakage from the punctured wound caused by that sized needle. By releasing the clamp on the distal side of the line of suture we can easily avoid having leakage occur. When any leakage occurs, if it is simply left alone, in the course of a fraction of a minute the leak will cease.

As to the appearance of the line of suture from within the vein, in just a few days the suture material, whether you use silk or hair, is covered over by epithelium.

DISCUSSION

Dr. A. J. Ochsner: I have sutured the larger veins a good many times with very fine silk, with very fine needles, without unusual preparation, and I believe that Guthrie's suggestion of the use of human hair is a good one, and I am going to use it whenever an opportunity presents itself. It is not nearly so difficult to use it in suturing large veins as one would suppose. In the small veins I have never attempted it because I have never injured small veins sufficiently to require suturing, and in the animal I have never sutured a small

vein, so that I am not personally in a position to speak of it in that regard, but when I read Guthrie's paper I made up my mind I would try human hair the next chance I had.

DR. FREDERIC A. BESLEY: I would like to ask Dr. Richter if there is any danger in suturing large veins from air embolism.

DR. RICHTER: A number of years ago I attempted to demonstrate to a class the danger of air embolism, and failed to succeed in doing so because the dog would not die. I tried to pump some air into one of the superficial veins with an ordinary glass syringe, and, of course, we all know now that death by air embolism is not a very easy thing to produce by this method. It has been shown experimentally that one can inject a considerable amount of air into the superficial veins without producing death from air embolism. I think the fear of death from air embolism during surgical operations has been less by reason of these experiments. Many experimenters say they have been unable to produce death with considerable quantities of air injected into veins. In doing some experimental work on the hepatic vein in liver surgery, I produced accidentally and definitely air embolism. We could hear it all over the room. The dog died, and post-mortem examination revealed definitely all the findings one would expect in a case of air embolism. I tried it again, and found that air embolism was produced easily by making an opening in the upper part of the vena cava or in the hepatic vein; then I found by suddenly compressing the chest I could force back a large quantity of frothy blood. Several times I succeeded in having the dog live after a distinct churning sound was easily heard in the room. That is the only occasion on which I came across air embolism during experimental work, and that started with my little clamp slipping and allowing the vein to open. Embolism and death were produced by admitting a large inrush of air through an opening in a large vessel near the heart.

DR. A. J. OCHSNER: It seems to me what Dr. Richter has just said might lead those who have not had a case of air embolism to suppose that air embolism is a thing that does not happen very easily. The fact of the matter is this, that if you have seen a case or two of air embolism you are in a position to watch the occurrence of it minutely after your attention has been called to it. You will find that air embolism occurs just as it did in this dog experiment to which reference has been made. When you have a vein held open in some way, so that a larger amount of air enters the vein than is forced in by your experiment, and there is a larger amount of air in the heart than at any one time, that is what kills the dog or the patient. As was shown by the experiments of Senn years ago, you can inject a large quantity of air into a vein if you only inject a small amount of it at a time, but if you let the heart pump air instead of pumping blood, the patient will die simply because it has nothing to pump. You can pump small quantities of air through the heart and do no harm because the heart always has blood to pump with the air. In two cases I saw an accident happen just in that way. The vein was held open by a carcinoma so that as the patient inspired, she drew blood out of the deep jugular vein, the vein was wide open, and with it she inspired an enormous quantity of air which reached the heart all at one time and caused death.

DR. COLEMAN G. BUFORD: I have seen two cases in which air embolism has occurred, one when I was associated with Dr. Fenger. In this case there was a wound in the jugular or subclavian vein and the patient sucked in enormous quantities of air and apparently death was imminent, but after plugging the vessel with a wet sponge and keeping up artificial respiration for half an hour the patient survived. The same thing occurred three years ago in a case at the Mercy Hospital, the patient having been operated on for tubercular adentitis. I was enucleating the glands at the time, the patient got a leak, and an enormous quantity of air entered the vein. I did not think the patient would live. We used a wet sponge in this case with which to plug the vessel, kept up artificial respiration, the patient became more blue, and when it looked as though she was going to die we stabbed one of the veins of her arm, which relieved congestion, and she recovered.

DR. DEAN D. LEWIS made some remarks on "The Histo-Pathology of the Hypophysis."

MECKEL'S DIVERTICULUM

BY DANIEL N. EISENDRATH, M. D.

The fellows of the society will recollect that three months ago I showed a specimen of ileus due to Meckel's diverticulum, the first case I had encountered, and there have been very few cases reported in this city. I recall the case of Dr. Harsha, and one by Dr. Halstead. Dr. Halstead

reviewed the subject in the Annals of Surgery in 1902.

About two weeks ago I was asked to see a boy at midnight with Dr. Collins of this city. When brought to the hospital the boy showed all the symptoms of intestinal obstruction. According to the mother's statement, the boy had complained of frequent attacks of colic. There was no specific localization of pain. On Sunday, about forty-eight hours before the time I saw him, he complained of pain all over the abdomen and started to vomit. At the time I saw the boy his pulse was 160; the abdomen was greatly distended, so that one could palpate several coils of intestine. There was evidence of shock and it seemed an almost hopeless sort of case to do anything with, but at the urgent solicitation of the parents I went in quickly and did what I considered was a practical thing to do under the circumstances, namely, an enterostomy as quickly as possible, and not try to look for the obstruction. I saw it was an emergency case. The boy was in a bad state. I made an incision and on going into the peritoneal cavity we found enormously distended coils of small intestine. I thought the case was most likely one of intussusception. I palpated through the rectum, but could not find anything. I palpated over the abdomen and could not find any tumor, but upon palpating through the right rectus incision which I made I found a small mass which I thought was an intussusception, but after bringing it up found it was a typical Meckel's diverticulum. Unfortunately the boy died about twelve hours after the operation. After death, through my laparotomy incision I secured this specimen which shows very well the mechanism of the obstruction.

When I presented my paper I spoke of six or seven different methods of obstruction. There was one variety of strangulation in which we had a diverticular ring. We had that in this case. This Meckel's diverticulum had a terminal ligament which was fully three inches long, attached to the end of the diverticulum and inserted in the mesentery of a coil of intestines close to the Meckel's diverticulum, and beneath that three or four coils of ileum became strangulated. In addition to that, at the point where the omphalo-mesenteric vessels had originally crossed the gut to form the mesentery of the diverticulum, there was a distinct stenosis, an inch distal to the insertion of the Meckel's diverticulum itself. At that point there was complete twisting of the bowel. We had, then, a diverticulum, stenosis at the point of crossing these vessels, and a volvulus.

The treatment was much more complicated in this than in the first case. In the first case all it was necessary to do was to sever the terminal ligament from its insertion into the mesentery and I could amputate the diverticulum, which I did, and the patient recovered. This boy was in such a bad condition, however, that I could untwist the volvulus and bring the diverticulum up into the wound, which I did, and using it for an artificial anus, but the intoxication was so profound that he did not recover. Wilms in his book called attention to the fact that in ileus one must consider the condition of the diverticulum. This diverticulum is strangulated and in addition to that, there are perforations, where the diverticulum was bent so sharply on itself that it became strangulated. I took off the ileum at the ileocæcal valve.

DR. PAUL F. MORF: I understood Dr. Eisendrath to say that there were only two cases of Meckel's diverticulum reported in this city, one by Dr. Harsha and the other by Dr. Halstead. Two years ago I showed a specimen of Meckel's diverticulum before the north side branch of the Chicago Medical Society, where intestinal obstruction had occurred in Meckel's diverticulum. I saw the patient after the intestinal obstruction had existed for five or six days. The patient was almost *in extremis* and the clinical symptoms of ileus were marked. We decided to operate. The abdomen was opened and the intestine found gangrenous. The Meckel's diverticulum had become strangulated. The Meckel's diverticulum in this case was about the size and length of the phalanx of the finger. The Meckel's diverticulum had its origin near the mesenteric border of the small intestine and had coiled itself around the intestine, and its origin was near the under surface of the mesentery and it became adherent to the mesentery. After that was released we could see a distinct narrowing of the gut. The real cause of strangulation was not the Meckel's diverticulum alone, but the fact that infection in the diverticulum had occurred.

DR. H. M. RICHTER: Two or three years ago I reported a case in which Meckel's diverticulum was the only structure in an inguinal hernia. I had diagnosed the case as one of strangulated inguinal hernia. When we cut down upon the hernia we found a Meckel's diverticulum. It was not strangulated, but its distal end was gangrenous and acutely inflamed, so that the patient really had an acute diverticulitis in a hernia not strangulated, and yet from the paresis which accompanied the acute inflammation I suppose it was analogous to that which we have in ordinary appendicitis. The patient had all the evidences and findings of an acute intestinal obstruction.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

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TUBERCULOSIS OF ASCENDING COLON AND CÆCUM

A REVIEW OF RECENT LITERATURE

BY FREDERICK G. DYAS, M. D.

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NOTE.— Reference must be made to the classic monograph published in 1898 by Conrath, to which every subsequent writer has alluded: Über die lokale chronische Coecumtuberculose. Beiträge zur klin. Chir., 1898, vol. xxi, p. 1 to 110.

The typical ileocæcal tumor occurs far more commonly than any other tuberculous neoplasm of the large intestine. The practical application of this lies in the fact that tumor formations in other divisions of the large intestine are in most cases carcinomatous and furthermore the distinction between tuberculosis and malignancy of the colon, even with the abdomen opened, frequently presents great difficulties without a microscopic examination of a portion of the tumor.

Amongst Küttner's cases and from a search of the literature, no instances of circumscript tuberculosis of the ascending colon were found by him in which tumor formation was not present.

The frequency with which the ileocæcal region is attacked is attributed to the richness of the lymph supply and to the stagnation of the intestinal contents at this point. Five per cent of primary tuberculosis occurs here. Solitary follicles and Peyer's patches are first involved. Tubercles may occur in the muscularis or serosa with the submucosa unchanged. The tuberculous material is caught up by the lymph stream and carried to the lymph node.

Küttner quotes Conrath as describing two types of tuberculous ileocæcal tumors from the standpoint of pathological anatomy, viz., subserous and submucus. The subserous is the more frequent and takes its origin usually from tuberculous ileocæcal glands, leading to tumor-like accumulations of connective tissue in the subserosa. The process is intercepted for a time by the muscularis but usually leads to ulceration of the mucosa. The submucous or mucous form is less common. The pathologic changes here involve the intestinal layers in an inverse order with extensive tuberculous change and connective tissue formation in the submucosa, being limited for a time by the muscularis but finally involving the serosa.

The tumor formation does not show a tendency to caseation and liquefaction but rather inclines to formation of fibrous tissue with stenosis or obstruction of the bowel.

Küttner holds, on the basis of his observations, in harmony with Wieting, that the first implantation of the bacilli in the lymphatic apparatus of the mucosa or submucosa may occur without the presence of an ulcer. The tuberculous tumor formation is brought about by the extensive irritation of the "tuberkeleruption" to tissue production, resulting in thick intramural masses of connective tissue with copious newly formed blood-vessels, scar formation, and contraction. This scar formation causes the hardness of the resulting tumor, and finally the extensive stenosis and longitudinal shortening of the affected portion.

Küttner also believes that ulceration is secondary although it sometimes apparently stands in the foreground. It may be absent in stenosis or with more extensive tuberculous tumors. He believes further that the formation of papillæ is important for the macro-

scopic diagnosis. These drop down from the crater of the ulcer as long polypoid formations. The finding of these growths lends greater probability to the diagnosis of tuberculosis, although the polypoid formation is not specific of tuberculosis but only a manifestation of the irritation of the tuberculous process in the intestinal wall upon the mucosa.

The importance of the fact that the colon ascendens has a predeliction for tuberculous tumor formation lies less upon pathologic-anatomic than upon diagnostic and prognostic grounds. Up to the present it has been held that a tumor which involved the colon ascendens and left the cæcum free was in all probability a carcinoma and Küttner says he is convinced that many tumors which are found in museums as carcinoma of the colon ascendens, could be proven with more exact microscopic examination to be tuberculous. In one case of tumor of the colon transversum which had been regarded as a permanently healed carcinoma, he was able to demonstrate with certainty the tuberculous nature of the tumor. Such cases show the great importance of detailed microscopic examination in any case of tumor of the large intestine.

Twenty-six cases of ileocæcal tuberculosis treated at Wolfler's clinic between the years 1895 and 1906 gave the following. The immediate results were good, viz., simple enteroanastomosis having a mortality of 8.33 per cent, while resection had 10 per cent mortality. However the permanent results with enteroanastomosis are very bad, but with resection, good.

The author comes to the conclusion that with ileocæcal tuberculosis with tumor formation, the enteroanastomosis is only a palliative operation; the pathologic process being scarcely at all influenced. It is, however, indicated as a substitute for resection where the patient is too weak for the radical operation.

Surgical insult in tuberculosis of the intestine is better born than an equal amount of operative trauma for any other pathologic condition of the bowel, hence the operator is justified in many cases in making the resection which holds out the best possibilities for permanent cure.

It is important to bear in mind from the standpoint of treatment that intestinal tuberculosis in young children is usually primary, while in adults and older children it is more often secondary.

PYLORIC STENOSIS IN INFANTS

A Review of Recent Literature

By C. G. GRULEE, M. D.

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In the past few years, the question which has been uppermost has been as to the nature of this affection, whether the primary condition was hypertrophy of the pylorus or a spasm of the musculature of the stomach, or whether both conditions were at times at fault. The most exhaustive discussion of this condition is by Pfaundler.

Pfaundler first described what he termed the systolic stomach. In this condition, in the perfectly normal child at autopsy, the stomach is found to be contracted and the pylorus apparently thickened. But by removing the stomach and introducing from 50 to 60 cc. of water, the contracted state of the stomach disappears and the pylorus is found easily penetrable. After calling attention to this condition, he goes on further to examine the cases in hand. The first point which he takes up is as to whether there are cases giving the symptom complex of pyloric stenosis which show a recognized narrowing at the pyloric orifice. After reviewing the literature very completely he answers this in the affirmative.

The second question which he takes up is as to whether there are cases having the symptom complex of pyloric stenosis with organic change at the pylorus. He recognizes here three classes of cases, the first class where the symptoms are present but neither autopsy nor operation reveal the true state of affairs. The

second class is where with peristalsis and pyloric tumor, the autopsy shows a negative condition of the stomach and pylorus; and third, those cases in which the clinical symptoms of pyloric stenosis exist without peristalsis or pyloric tumor, and with negative autopsy findings.

Having given examples of these cases, he comes to the following conclusions:

First. There are individual cases whose clinical signs point to a pyloric stenosis the basis of which is an organic condition that is an hypertrophy of the stomach and especially of the anterior musculature. (Type Hirschprung.)

Second. There are cases whose clinical relations allow one certainly to assume a narrowing of the pylorus but where, however, a recognizable organic basis is completely lacking.

Third. Therefore the dietetic standpoint in the literature of pyloric stenosis in exceptions seems justified. The possibility of a close connection in the functionary and organic cases in a pathogenic respect still remains.

The views of Pfaundler are held largely by American writers, among them Scudder and Koplik, who have recently reported cases. The findings of Bernheim-Karrer would seem, however, to point to a more frequent presence of a pyloric tumor than is commonly recognized.

Of twelve cases previously seen, he had the opportunity of observing seven for a long period of time. These cases had not been treated by operation. He examined the motive capacity and the acidity of the stomach, and comes to the following conclusions:

"In a majority of the cases of pyloric stenosis in infancy seen by me, in the second or third year of life, there was a very marked absence of motility with high and sometimes very high hyperacidity. Since, in spite of this, no disturbance of the general findings, especially no signs of discomfort, had been observed, it is improbable that the conditions of spasm play a role. Pyloric stenosis due to congenital pyloric hypertrophy might exist for months or even years in the latent state." Very interesting in this connection is a case of Russell who reports an autopsy on a boy of 4½ years who died of cyclic vomiting. From birth on, every few months, this child had attacks of vomiting which had lasted for twenty-four hours and were accompanied by epigastric pain. The autopsy showed the pyloric orifice narrowed and the musculature distinctly hypertrophied. The stomach dilated contained "a fair amount of food stuff."

These cases would seem to show that pyloric stenosis is not necessarily accompanied by pylorospasm or by continuous vomiting, and therefore would seem to raise some doubt as to the etiology of the pyloric narrowing in cases of true congenital pyloric obstruction. In this connection Wernstedt takes the view that the spastic condition is in a large proportion of the cases not the primary one. He states that as yet no case of true narrowing of the pyloric orifice has been sufficiently described to prove its existence. He also asserts that the hypertrophy of the musculature may very well be due to long inaction. He thinks that the continued difficulty of forcing food through the pyloric orifice may lead to chronic digestive disturbance which will eventually prove irreparable.

As to symptoms, three stand out, vomiting, the increased peristalsis, and the presence of the pyloric tumor. The first is always present, and the last two in a favorable percentage of cases. This variation seems to depend largely upon the individuality of the man who reports the case.

Koplik in reporting his fifteen cases, divides them into eleven cases of pylorospasm and four cases of congenital pyloric stenosis. Of the eleven cases of pylorospasm some seemed to be so mild that many physicians would probably not regard them as belonging to this group of cases. Interesting in connection with these cases, are two cases, one reported by Adler and the other by Weill and Chalier. In these cases, not only a hypertrophy of the pylorus existed, but also a hypertrophy of the musculature of the stomach, and in Adler's case the distension and hypertrophy of the stomach were so marked that there was a question as to whether the case was not one of Hirschprung's disease.

In regard to the treatment there seems to be still a distinct difference of opinion.

German writers almost without exception treat their cases without operation, while in America the case which goes without operative treatment is the exception. This is probably due to two facts. The first is the greater technical skill of the American surgeon, and the second, the fact that the German includes in his cases the pylorospasm, while the American to a great extent, confines his to the congenital pyloric type.

In regard to non-operative treatment, I have been able to find reports of fourteen cases of recovery and five deaths. (Machell, McClanahan, von Starck, Weill and Chalier, Kaspar, Koplik, Rohn.)

This series does not include thirteen cases reported by Feer in which the ultimate result is not reported, and twelve cases of pure pylorospasm reported by Koplik. In respect to non-operative treatment, the method of feeding takes a prominent position, some following Huebner's method of long intervals and large amounts, while many others follow the method of Ibrahim of very small quantities at frequent intervals.

The kind of food best suited to this condition is probably breast milk. Feer modifies this by skimming the milk and giving the child fat free breast milk.

In regard to medication, opiates are frequently applied, and Koplik used sodium citrate without marked effect. Rosenstern has reported four cases of pylorospasm in which the vomiting was favorably affected by rectal enemas consisting of:

NaCl	7.5
KCl	0.42
$CaCl_2$	0.24
Aqua	1000

As to the operative treatment, I have collected a series of twenty cases with fourteen recoveries and six deaths. By far the most important of these series is

that of Walls with eight cases and one death. (Operated by Van Hook, Murphy, McArthur and Richter.)

Other cases are reported by Bradley, Shepherd, Scudder, Bunts, Nové-Josserand and Pehu, Kaspar, Mitchell and Oliver (2), and Koplik (2).

Of these twenty cases, one was a pyloroplasty with recovery; in the case of Bradley the variety of operation is not recorded. Result death. In all the other cases, gastroenterostomy was performed.

Ten of the posterior variety with two deaths; four of the anterior variety with one death; and one in which the result was a failure, the type of gastroenterostomy is not mentioned.

It does not seem fair to judge of the efficiency of the operative treatment by statistics, because in a large number of cases operation is done as a last resort. Where operation is performed early in the disease the results are much more frequently favorable. As to the time at which operative interference should be attempted, there are as yet no criteria. Wernstedt states that in his opinion, if an operation is to be done, it should be done early, since later the damage to the intestines may be so great as to preclude all possibility of recovery.

No review of the recent literature would be complete without mention of Ibrahim's excellent and exhaustive article on this subject which has recently occurred. The attempt in this review has been to supplement this article with any subsequent facts which may have appeared.

A Method of Splinting Skin Grafts. J. S. DAVIS. *Johns Hopkins Bulletin*, 1910, vol. xxi, page 44.

Davis advocates the use of a meshed net soaked in a solution of gutta percha 15–30 parts in 150 parts of chloroform, allowed to dry and then sterilized in three changes of 1-1000 bichloride, washed in salt solution and dried; then pressed snugly down on grafted area. Overlapping edges secured by adhesion.

H. F. HELMHOLZ.

Tuberculous Cervical Adenitis; A Study of the Tubercle Bacilli Cultivated from Fifteen Consecutive Cases. PAUL A. LEWIS. *Journal of Experimental Medicine*, xii, 82–104.

To determine if possible what type of tubercle bacillus is the cause in the ordinary tubercular cervical adenitis, the writer studies fifteen consecutive cases. The material from the glands is inoculated into guinea pigs and after 3–5 weeks cultures were taken from the guinea pigs.

He describes the bovine bacillus when grown on coagulated dog serum as a short, straight, plump and solidly staining organism. The human, a longer, frequently curved, thinner and often irregular staining (beaded) organism. The human type grows as a thick wrinkle membrane from the beginning, which tends to spread rather slowly and thickens as it spreads. The bovine spreads rapidly as a thin translucent membrane.

In a summary he states that out of fifteen cases of primary tuberculosis of the cervical gland, nine were of the bovine type and six human; making his differentiation from adaptability to artificial cultivation character of growth and virulence for rabbits and calves.

JOHN A. WOLFER.

Prevention of Bleeding in Harelip Operations (La hæmostasis en la Cheirorrafia). *El Siglo Medico*, 1909.

Hæmorrhage in harelip operations may be prevented by the use of a long silk ligature with a needle on each end. By means of one needle the silk is passed through the lip from within outward at the junction of the lip with the gum and the end tied about the free edge of the lip in a slip knot, tightly enough to shut off the coronary and other vessels. The other end is passed through the lip on the other side of the cleft and tied in the same way, the middle loop or "bight" of the silk being left hanging below the chin. The constriction of the vessels allows a practically bloodless field for the paring of the edges of the cleft and the placing of the sutures, which are left untied until all are in place, when the slip knots are untied and the middle loop of the silk drawn up behind the lip as the first suture and tied; the rest of the sutures are then tied and dressings applied.

The author claims that this method allows a bloodless field without the crushing of tissues consequent on the use of a clamp. B. J. O'NEILL.

When to Operate for Appendicitis. R. P. ROWLANDS. *British Medical Journal.*

The author strongly advocates operation at the earliest possible moment, pointing out that the many complications of the disease are preventable through this means.

He states that interval operations are only permissible where the case has not been seen before, or has previously refused operation. GORDON T. COURTENAY.

Resistance Produced in Mice Against Transplanted Cancer by Auto-inoculation of the Spleen. WM. H. WOGLOM. *Journal of Experimental Medicine*, xii, 20–34.

On the basis that the blood of one mouse inoculated into another produces a refractory condition to the inoculation and transplantation of tumors and since he is unable to obtain any quantity of blood from mice, the writer conducts a series of experiments using the spleen instead of blood. His object is to come to some conclusion regarding the value of this procedure. He removes the spleen from the animal and makes an emulsion of it by cutting it in fine parts with a pair of scissors. He then takes a series of mice of approximately the same age and weight and inoculates half of them with this emulsion. Twelve days later he inoculates all of the mice with particles of an adenocarcinoma. The inoculation in each instance being in the axilla. Of those inoculated with the spleen emulsion 71 per cent developed cancer, of the others 69 per cent developed cancer. Experiments are still under way but the writer says "the protective action produced by homologous undamaged spleen was completely abolished." JOHN A. WOLFER.

BOOK REVIEWS

SURGERY AND PATHOLOGY OF THE THYROID AND PARATHYROID GLANDS. By A. J. Ochsner, M. D., and R. L. Thompson, M. D. St. Louis: C. V. Mosby Medical Book and Publishing Co., 1910.

The authors appropriately dedicate their book to Dr. Charles H. Mayo in "recognition of his splendid work in the development of thyroid surgery in America."

The chapter on pathology includes a description of the well established pathologic lesions, illustrated by excellent microphotographs from Dr. L. B. Wilson of the lesion in Graves' disease and colloid goiter.

In the chapter on diagnosis, the symptoms were grouped as major, minor, and immaterial, a valuable arrangement and one that might be used to advantage in many other clinical descriptions. This very common error of undue stress on minor symptoms has been nowhere more conspicuous than in the undue emphasis put upon the eye symptoms in Graves', the author has shown the relative value of the symptoms.

On page 41 the author states that on "the presence of tachycardia together with even the slightest degree of exophthalmos or enlargement of the thyroid gland, a positive diagnosis of exophthalmic goiter can always be made." The description of the clinical manifestations of the disease and the method of diagnosis are given with the clearness and the clinical insight which characterizes Dr. Ochsner's writings on other clinical subjects, especially his masterly studies on acute appendicitis. The danger of using thyroid extract in Graves'— a too common error — is wisely emphasized. The chapter on diagnosis is especially strong and will undoubtedly prove useful.

In the chapter on treatment of simple goiter, the treatment by injecting directly into the substance of the gland 90 drops of a 5 per cent solution of carbolic acid is especially recommended. In the one on surgical treatment of Graves', rest and diet and the use of hydrobromate of quinia and Beebee's serum are conservatively commended.

One of the most important features of the description for the operation of goiter is the specific direction for the proper administration of the anæsthetic. These directions should be quite as useful in other operations as well. If the book contained nothing more than this description, its publication would in my opinion be amply justified.

In summing up the indications for operation in Graves' disease, the author makes the following statement: "Whenever improvement in these cases from hygenic, dietetic, and medicinal treatment, together with rest is only of temporary duration, then operation is strongly indicated." * * "The recovery after surgical treatment will be much more perfect if the operation be performed before the heart and other organs have suffered severely by these recurrent floodings of the circulation with thyroid poison." In the cancer of the thyroid, the author believes that cure is rarely effected when sufficiently advanced to permit a correct preoperative diagnosis. The cured cases are, for the most part, those early cases in which the disease was not suspected at the time of operation.

In the concise and clear description of the operative technique Kocher's classical work is closely followed. The illustrations are clear, and well chosen, but many readers will probably wish that they had been placed a little more conveniently in relation to the text, or grouped together at the end of the chapters they illustrate. The difficulty of dealing with the prognosis in a statistical manner was very properly pointed out. The author believes that there are all degrees of recovery, and, at all events so many factors enter into the result that have nothing to do with the treatment, whether medical or surgical, that the value of statistical treatment is relative. The author states that the cytolytic serum of Beebee and Rogers is most effective in the earlier stages of the disease and he has not found the Moebius serum useful.

Those who are familiar with Dr. Ochsner's clinical work are aware that he is not only an expert psychologist but a philosopher as well. This is disclosed in his discussion of the social relation of the post-operative patient to the prognosis.

In the closing chapter heredity is discussed. The text of this chapter is illustrated by several striking photographs. Dr. Ochsner has planned the volume in accordance with the spirit of the times in including the point of view of the laboratory by associating with him Dr. Ralph L. Thompson, of the University School of Medicine of St. Louis, who contributed the chapter on the pathology of the thyroid in part one and all of the second part of the book dealing with the parathyroid glandules. This is a just tribute by an eminently practical surgeon to the great role now played by experimental medicine. In their preface the authors very justly state "an apology for the compilation of the main facts regarding the parathyroid glandules here presented in not necessary. These vital organs have been too long neglected both in medical text-books and in medical teaching." In this chapter Dr. Thompson has performed the arduous task of summarizing all the work of value reported in the literature, and has given an account of his own important researches. The historical account is interesting. The description of the anatomy, histology, and pathology is complete, clearly presented, and is beautifully illustrated.

Under pathology, cysts and tumors are especially described. The discussion of the relation of parathyroid glands to post-operative tetany is especially interesting. Then follows a discussion of the relation of

parathyroid glands to medical tetany, and finally a chapter on parathyroid therapy. A careful study of these chapters will amply repay every physician and surgeon. While our knowledge of the function in diseases of the parathyroid, as well as of the thyroid, is still far from being completed, there are at present many useful facts known, and still more suggestions are given for future lines of investigation.

On the whole, the authors have given us a judicial summing up of our present knowledge of the normal and the pathologic physiology and histology of the thyroid and parathyroid glands and have effected an excellent blending of clinical and experimental medicine. GEO. W. CRILE.

A book which "takes stock" accurately of a living subject is a pleasant base-line in our wanderings through the *Index Medicus*. If we have confidence that it has dropped the errors as well as condensed the verities of the current literature, thereafter for ordinary purposes, we begin our studies with it and analyze only what is published later.

Such a book we have much needed for our knowledge of the thyroid gland, and perhaps, even more so with respect to the parathyroids. An enormous literature has grown up concerning these organs and much of it is so dissonant that there results only a noisy clangor rather than a dominant theme. Many of our troubles come from "knowing so much that isn't so." Our knowledge of the pathology of the thyroid, as well as of the treatment of its lesions, during the last five years, has seen a rapid process of elimination and simplification. Most every one now concedes that the eccentricities of the gland are explicable by the same principles which govern stimulation, over and under-functioning and degeneration of other organs. While the truth about the essential irritant in goiter probably lies buried in the *terra incognita* of the embryogeny and physiologic chemistry of the ductless glands, yet the immediate pathology of the organ is now clearly recognizable. On this a rational treatment is now based. The forbidding seven-headed dragon of thyroid surgery has become a very docile and dependable dragon, indeed, when approached with firmness, skill, *and simplicity*.

The parathyroids are much more troublesome. Just when we think we have settled the basic fact of their essential relationship to tetany, Kocher upsets our concept by preventing tetany in a parathyroidectomized dog by implanting a bit of *thyroid* in the animal's tibia. Then Thompson, Leighton and Swarts follow this up with certain experiments which suggest that even traumatic injury to the long bones may in like manner ward off tetany. At the same time, Vincent and Mrs. Thompson are adding other disturbing data by their comparative studies of the development of thyroid, parathyroid, and related tissues.

Indeed we shall probably need to know much more of the histogenesis and histochemistry of all the ductless glands before we reach the last word on their physiology or pathology. But it is well at this time to take bearings.

All this is *apropos* the appearance of Ochsner and Thompson's book on the *Thyroid and Parathyroid Glands* which is reviewed on another page. While it does not profess to give all the minutiæ of thyroid investigation, nor even of parathyroid studies, into which it goes more in detail, yet it does voice clearly the dominant theme of the current chorus.

LOUIS BLANCHARD WILSON.

THE PREVENTION AND TREATMENT OF ABORTION. By Frederick J. Taussig, M. D. St. Louis: C. V. Mosby Medical Book and Publishing Co., 1909.

This monograph embraces in its twenty-one chapters a very simple and yet comprehensive study of abortion from the standpoint of the patient, the physician, the people and the law. Being written professedly for the general practitioner, the author very wisely avoids the discussion of the more theoretical and as yet imperfectly established propositions, and confines himself to the systemization of those scientific principles and practices which experience has definitely endorsed.

His treatment of sepsis accords quite closely to modern practice, though some surgeons may take exception to the use of the gauze iodoform drain in the uterus after curettement for sepsis or incomplete abortion.

When drainage must be secured contrary to the laws of gravity the wick-like function of such a device is highly desirable but a hollow inverted organ is more likely to drain rapidly and perfectly if no obstacles diminish its channel or obstruct the outward flow.

The obstructive principle is better employed as the author advises in the various hæmorrhages which complicate these cases.

Then, too, it might have seemed desirable to include in this chapter some reference to Watkin's "laissez-faire" method of treating sepsis, since this principle can be so happily employed in every variety of medical practice whether near to or remote from the centers of light.

Besides its universal practicability it obviates in many cases those dangerous consequences of meddlesome interference which are found so frequently in consultation practice.

The author has elucidated the text by a series of tables and charts to aid in the proper appreciation of the conditions which they thus summarize.

The operative detail is intelligible, adequate, and well worked out, while the imminent danger of instrumental perforation is presented with condign stress.

In general the letter press is good, the wide margins give an attractive appearance to the page, the illustrations actually illustrate, and the style is pleasing.

The fact that the book is not burdened down and the meaning obscured by a surplusage of scientific terms makes it not only more valuable and useful to the general practitioner for whom it was intended, but it makes a more satisfactory as well as reliable companion for the specialist — however eminent.

CHARLES B. REED.

Fig. 1

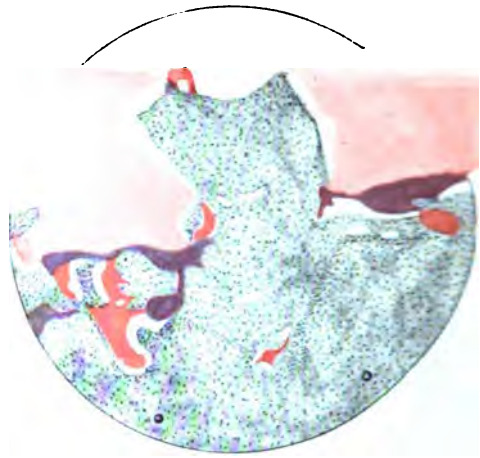

Fig. 2

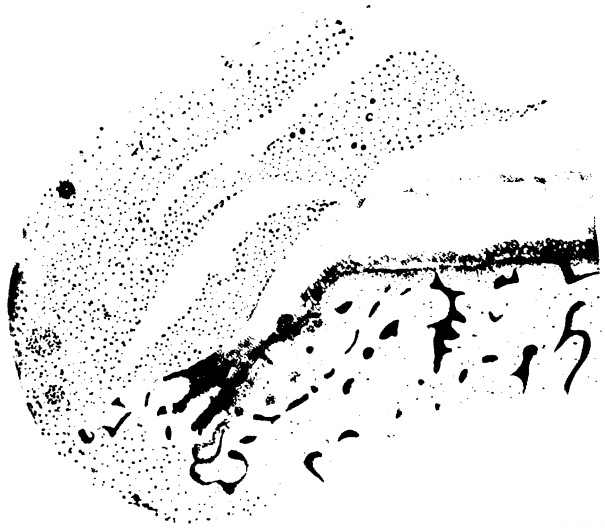

Fig. 3

Fig. 4

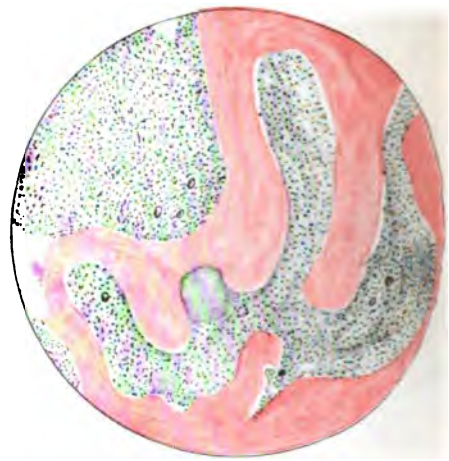

Fig. 5

SURGERY, GYNECOLOGY AND OBSTETRICS

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A STUDY OF JOINT TUBERCULOSIS

WITH AN ORIGINAL THEORY AS TO ITS LOCALIZATION, AND WITH A NEW PLAN OF OPERATION BASED ON THE PATHOLOGY

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THE treatment of joint tuberculosis at the present day is almost entirely empirical. The widest differences of opinion exist as to the interpretation of the phenomena of the disease, and few facts have been established beyond peradventure. As in other cases, so in this the diversity in the last analysis depends upon ignorance. We are ignorant of many of the fundamental facts that would enable us to reason to a logical conclusion, and we have tried to substitute clinical experience for exact knowledge, to reason back, so to speak, from effects to causes, and to regard what we believe as what we know. The study of the pathology of bone and joint tuberculosis seems to have been comparatively neglected. With a few notable exceptions, those who have written on the disease have confined their attention to its clinical side. In the hope of adding, however humbly, to the fund of knowledge, this study has been undertaken.

Our method of procedure has been as follows: When a joint or portion of a joint came into our possession we submitted it to a thorough examination, both macroscopical and microscopical, cutting sections from the bones and soft parts, and noted down our findings. We then made an abstract of the patient's history as taken in the hospital, and of the operation that had been performed, and where possible followed the patient after his discharge and observed his further progress. This last was difficult, and often unsatisfactory. In many cases the last word had been spoken when the discharge from the hospital was signed.

The specimens at our disposal are sixty-two in number, removed from fifty-five patients. From four of these patients two specimens were removed from the same joint at different times; from three others the second specimen was removed from another joint. They are divided as follows: of the knee, twenty-seven;

Fig. 1. Bone tuberculosis. Drawing of bony trabeculæ undergoing rarefying osteitis. (Zeiss, objective C.) The section is taken from the side of a necrotic bone cavity. Observe the giant cells (osteoclasts) and the osteoblasts. The marrow is not drawn in the picture.

Fig. 2. Bone tuberculosis. Water-color drawing. Low power. Observe the tuberculous granulation tissue in the marrow bursting through the cartilage. No evidence is present of any "layers of fibrin" upon the cartilage, although the cartilage has been perforated. Sections of the synovial membrane failed to show any tuberculosis.

Fig. 3. Synovial tuberculosis. Low power picture showing marked hypertrophy of the synovia with extensive tuberculous involvement. At one spot may be seen a thickened artery. The superficial parts are necrotic. Granulation tissue is spreading under the cartilage, interfering with its nutrition, and at one spot starting to break through.

Fig. 4. Bone tuberculosis. Low power picture showing granulation tissue in the marrow and two areas of necrosis. The cartilage has been loosened by interference with its nutrition from beneath, but there is no evidence of any "layers of fibrin" on its surface. Water-color drawing.

Fig. 5. So-called bone tuberculosis. This water-color picture shows the typical tuberculous myelitis as seen under low power. Two areas of necrosis are present and several giant cells. The bone structure itself escapes.

M.M. Old healed knee-joint tuberculosis in a child. Bony union following secondary infection and prolonged suppuration. X-ray taken in 1909 at the age of about 13.

of the ankle and tarsus, eight; of the hip, seven; of the elbow, seven; of the wrist, six; of the shoulder, three; and of the fingers and toes, one each. Besides these we have a specimen from the humerus and one from the tibia in which the joint was not involved. Thirty-seven male patients contributed forty-two specimens; fourteen females contributed sixteen joints; and in four cases the sex was not mentioned. In addition to our clinical material we have injected eight joints in three dogs with a pure culture of the tubercle bacillus. The surgeons to whose courtesy we are indebted for our material are sixteen in number, and in view of what we are about to say it seems well to emphasize the fact that they represent a high order of ability.

Before beginning the discussion of the specimens themselves, we wish to call attention to the remarkable frequency of errors in diagnosis. In two cases the clinical diagnosis was not given; in thirty-nine tuberculous joints it agreed with the final laboratory findings; in six the laboratory diagnosis was tuberculosis, and the clinical, no tuberculosis or doubtful. In fifteen cases of joints operated on as tuberculous or without definite diagnosis, tuberculosis was not found in the laboratory. This gives us 65 per cent of correct diagnoses, and when we consider that several of these were assisted by a previous pathological examination, the unreliability of the clinical diagnosis alone is even more apparent. In each case we have taken as the clinical diagnosis that made by the operator. In those cases where we have noted the various diagnoses of different men on the same joint, the results were even more startling. So disquieting were they, indeed, that we submitted the specimens to a second thorough examination, endeavoring to modify our conclusions, and to find traces of tuberculosis where we had found none before. The second examination did not change the results of the first; and the cases clinically non-tuberculous, in which tuberculous tissue had been found, admitted of no change.

Now, it may be argued that tuberculosis may exist in a joint and may escape detection in the laboratory, and that if a joint is clinically tuberculous, it is tuberculous in spite of what it shows under the microscope; but to this the answer, of course, is that all our clinical classification as well as our definition has been built up on laboratory findings, and that unless tuberculosis can be demonstrated under the microscope the joint is not tuberculous. If no microscopic examination be done we simply call a joint tuberculous because of its clinical similarity to other joints in which the characteristic tubercle has been demonstrated under the microscope.

We will admit, however, that as the appropriate stains have not been used to detect the presence of the tubercle bacillus, there may be a small margin of error in our conclusions.

Not only in the matter of diagnosis have errors been found in the statements made in the histories. Notes taken at the time of operation are not always reliable. One opera-

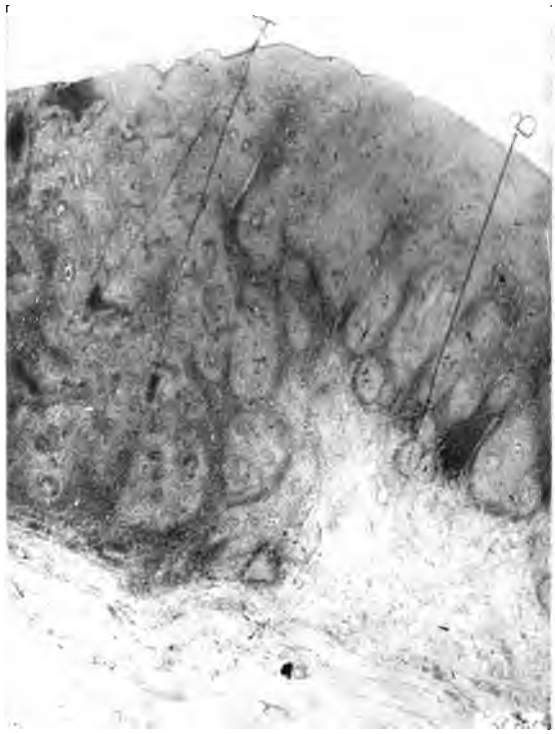
tor pronounced the bone soft and much "eaten away" because it broke in his lion-jawed forceps, but in the laboratory it proved to be quite hard. Another history gives the information that "scattered tuberculous foci" were found abundantly in the head of the bone. These "scattered tuberculous foci" were small, white particles of cartilage that had evidently been carried in on the saw, and no tuberculosis could be found in the specimen.

It may be well here to lay down a definition of the term "joint tuberculosis." It is the reaction of the tissues in and about a joint, or of some of them, to the presence of the tubercle bacilli and of their toxines. These can reach the joint in only one way, except in rare instances of direct infection from without the joint, and that is through the blood; and Müller produced the disease in animals by the injection of pure cultures into the nutrient arteries of bones. Parenthetically it may be said that those who have injected the joint itself with the bacilli have produced a tuberculous abscess in the joint, and thus have not exactly imitated nature's method. Whether in patients suffering with the disease, the bacilli are carried there primarily, or whether they are brought from some other focus in the body, is not always certain. In 20 per cent of König's cases no tuberculous lesion was discovered elsewhere. When the bacilli are deposited in the joint they give rise to the formation of the typical tubercle, and almost at this point we may take leave of theory, and trace the succeeding steps of the disease.

Pathology. Of the four essential structures of a joint, bone, cartilage, ligament, and synovial membrane, all connective tissue structures and all formed from the mesoblast, the first and the last offer the field for primary invasion. This view has been held for many years abroad, but in America, largely owing to the teachings of Nichols of Boston, the opinion has prevailed in recent years that all cases of joint tuberculosis originate in a bony focus. Nichols, basing his conclusion upon a study of more than one hundred and twenty specimens, wrote that even those cases which seemed to be primarily synovial, if examined carefully would show that the synovial disease was merely an extension from that of the bone.

M.M. Old healed knee-joint tuberculosis. X-ray taken in 1910. Observe the change in the bone structure at the old level of the joint — a condensation about the periphery and a prolongation of the medullary canal of the tibia upward.

This theory is attractive and makes for simplicity, but our observation does not tend to confirm it. In the first place, primary synovial tuberculosis is found in tendon sheaths, which differ in no essential from the synoviæ of joints. In the second place, a careful examination of our specimens fails to reveal in a number of them any bone involvement whatever, and in many of them any signs of a bony focus. Third, there seems to be a difference, more or less plainly marked, in the clinical behavior of synovial cases and of those of bony origin. Again, in many cases in which the bone and synovial membrane are both involved, the damage to the bone is so insignificant and that to the synovia so extensive, that it seems impossible for the disease to have started in the former and spread to the latter



303 B. Synovial tuberculosis. Section from synovial membrane showing typical tuberculosis. X about 20 diameters. A, Areas of necrosis. B, Giant cells.

with so little damage to the original host. We quote three cases for illustration. A woman patient with extensive pulmonary tuberculosis underwent in Roosevelt Hospital an excision of her tuberculous right ankle. Shortly after, her leg was amputated on account of secondary infection. No mention was made in her history of any disease of the other leg. She was discharged cured from the hospital, and returned in six weeks with a typical tuberculosis of her left knee. This was resected, and showed in the laboratory very extensive disease of the synovia, but no bone involvement. For the process to have originated in bone after her discharge and then to have spread throughout the synovia, is improbable, while that a bony focus in her left knee could have existed during her first stay and could have escaped attention seems even less likely to one acquainted with the symptoms attendant on bone disease. Another patient, under the writer's conservative treatment for five years, at length consented to a resection of his knee. The bones showed no tuberculous disease, but the synovial membrane was involved. Another patient gave a history of seven years duration, with very slight symptoms of pain and disability. He had a moderate amount of fluid in his joint and slight limitation of motion, but no circumarticular thickening, and little if any, muscular atrophy. An exploratory incision was made into the joint and several tabs hanging from the synovial membrane were snipped off. The cartilages appeared smooth. A laboratory examination of the material taken out revealed typical tuberculosis. An excision done two months later showed that the cartilages, smooth before, had begun to be eroded, but no tuberculous tissue could be found in the bone. Collections of cheesy material were scattered through the synovia. Other cases could also be quoted.

To prove absolutely in any case that a minute bony focus might not be present would be an exceedingly difficult matter, but, given the occurrence of primary synovial disease in tendon sheaths, the failure to find a bony focus by a careful examination in a number of joints in which the synovia is extensively diseased may be accepted as conclusive.

We shall take up first the cases beginning in a so-called bone focus, and, inasmuch as in the knee the disease can best be observed, it is the custom of writers on this subject to take this joint as typical. We shall follow this custom the more readily, as most of our specimens are from the knee.

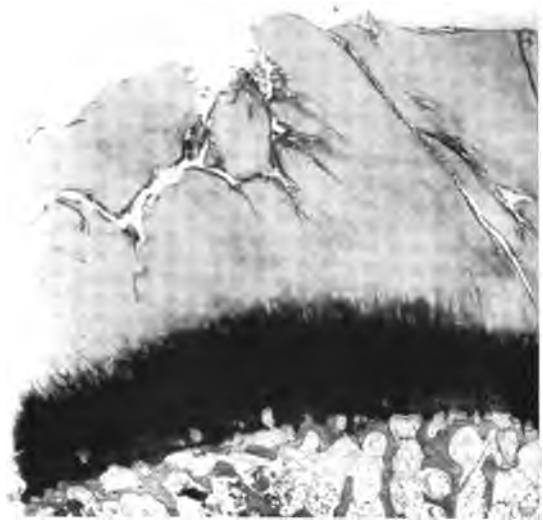
The primary tubercle is formed in the marrow of the epiphysis of one of the long bones (or of the patella), and, as in other organs of the body, the tuberculous inflammation spreads at the periphery, with the formation of other tubercles and their coalescence, and a tendency to break down at the center and to become necrotic. The granulation tissue thrown out around the tubercles in the effort of repair may also become invaded, or it may be converted into fibrous tissue and form a capsule more or less complete. In some of our specimens the division of the tuberculous tissue by fibrous septa is well marked. A study of these joints teaches the impracticability of the attempt to divide the disease into stages, or

periods of active invasion and repair. It does not advance to a certain point and then recover, but almost invariably invasion and repair are going on together, sometimes at the same part of a joint, sometimes in different parts. The tuberculous granulations advance in the marrow, and, surrounding the trabeculæ, shut off their nutrition and kill them, either en masse, with the formation of a sequestrum, or in small particles, giving the "bone sand" so characteristic of the disease. Often the trabeculæ can be seen under the microscope to be undergoing rarefying osteitis. Sometimes they may be seen to be lying dead, surrounded by pus cells.

The further details of this pathological process involved in the spread of the typical tuberculous tissue, its characteristics, its shape, etc., have been so often described and seem so well understood that it hardly seems wise to go into them here, further than to say that the attempt to describe the various shapes that the morbid process may have and to classify the cases on this basis seems futile. The use of the terms "caries sicca," "joint fungus," etc., seems also unwise, as indicating distinct morbid processes, whereas they are merely different forms of the same disease.

The bone in the vicinity may cut easily with a knife, or it may be much harder than normal. Often, at operation, drops of fat will follow the saw, so-called "fatty osteomalacia." Sometimes when the bone is cut for sections it will float in water.

The tuberculous tissue spreading in the marrow may find its way directly to the periosteum, and, breaking through this, may form an abscess in the surrounding tissues and so reach the surface without ever involving the joint; but in the great majority of cases the disease seems to seek the joint as if with a defined purpose. The cartilage offers a barrier to its progress, and when the tuberculous granulations reach it, one of three things happens, viz., 1, the cartilage, deprived of its nutrition, is perforated and so affords access to the joint; 2, the granulations spread out under the cartilage, mushroom, so to speak, and, shutting off the nutrition of a large area of it, lift it off in a leaf or flake, and thus reach the joint; or, 3, they may travel along under



303. Synovial tuberculosis. Section from patella showing fibrillation and fraying of articular cartilage. X 20 diameters. The cartilage has begun to degenerate, but no "layers of fibrin" are to be observed on its surface.

the cartilage and gain the joint at its side. During this process the joint may be the seat of a serous effusion. When it is once involved, the disease may spread rapidly through all its structures, and involve the synovial membrane and the other bones, or it may involve only parts of the joint and leave the rest almost normal. Frequently adhesions are formed as if in the effort to shut off the disease, similar to those in the peritoneal cavity or in the pleura; and sometimes sections from one region will show normal joint structure, while from another they show typical tuberculosis. Hence the unreliability of a section removed from a joint for diagnosis. Often one condyle and the opposing tuberosity will be badly involved, while the other condyle and tuberosity are practically sound. The further course of the disease now will depend on the relative production of fibrous tissue and of soft granulation tissue and serum. If the fibrous tissue predominate, the tuberculous granulations are slowly encapsulated as they form and spread, and the joint becomes in whole or in part a mass of fibrous adhesions which deprive it almost entirely of motion. If the soft granulations be not organized, white corpuscles and serum are added to the liquefying mass and a

1117. Bone tuberculosis, showing spread of the tuberculous process under the periosteum and cartilage. Specimen from external condyle in 12-year-old child. Joint is not yet involved. X 8 diameters. A, Articular cartilage. B, Epiphysis. C, Epiphyseal line. D, Periosteum. E, Area of tuberculosis.

cold abscess is formed which, breaking through the capsule, escapes into the surrounding tissues, and then, becoming secondarily infected with pus germs, gains the surface and discharges its contents.

Clinical experience teaches that in children the process may be halted at almost any stage, and the joint may recover with a fair range of motion. In some cases complete bony ankylosis takes place. In adults, we believe, neither of these results is ever obtained, and cure is always brought about by fibrous encapsulation and is never complete.

In the cases with a synovial origin, the primary tubercle is deposited in the membrane itself, not, as König teaches, by the infection of the surface layers from a "tuberculous exudate" in the joint cavity. The synovia may be badly diseased and still have a smooth, healthy looking surface. In our opinion the start is usually in the folds or fringes found in the recesses of the joint, and the disease may remain more or less localized, or it may spread throughout the entire joint, with or without involvement of the bone. The fringes and villi become thickened and enlarged, and the entire membrane may also be much thicker than normal. One of our cases was characterized by the formation of pedunculated bodies hanging in the joint (lipoma arborescens), varying from the size of a pea to that of a large lima bean, and in the largest of these bodies a spot of calcification was revealed on section. Tubercles may often be seen by the naked eye studding the synovia, and scattered through its substance. The folds of the membrane may be so hypertrophied as almost to hide the articular cartilage. They seem to be adherent, but usually are found to be merely lying upon it. In joints that have been long diseased the synovia may have almost disappeared, *leaving little else than fibrous tissue.* Under the microscope the typical tubercles are seen, often with areas of necrosis.

The frequency of obliterating endarteritis has not been appreciated. It was present in the majority of our specimens to a marked degree. Sometimes the production of fibrous tissue is well marked in the diseased area. sometimes one finds abundant new granulation tissue in the membrane or upon it. The layers of fibrin emphasized by König are not often present. In none of our joints have we seen the "rice bodies" described by others. It is necessary for a thorough examination of these joints that sections be made from many parts of them; otherwise one's conclusions are liable to error. In one of our specimens, diagnosed before operation as tuberculous arthritis of the ankle, a laboratory diagnosis had been made of "chronic inflammation; no tuberculosis." The entire joint was a mass of fibrous adhesions, but in one recess was at length found a small cheesy nodule, which under the microscope was seen to be an old encapsulated cheesy tubercle.

We have seen that while the bone is being destroyed by the growth of the tuberculous tissue in its meshes, that is, in the marrow, the bony structure itself is never invaded, but is simply killed by the interference with its nu-

trition. Much the same may be said of the ligaments and cartilages. The behavior of the cartilage is especially interesting and has been the subject of much discussion. König attached great importance to the precipitation of layers of fibrin from the joint exudate upon the cartilage, and to their subsequent organization and tuberculous infiltration. This "tuberculous pannus" extending in from the margin then was supposed to play a great part in the subsequent erosion and destruction of the cartilage. In fact, the role accorded by König to the exudate in the joint is the principal one in synovial disease, and through it in the cases with bony focus he thinks that the synovia is affected. He traces his pathology of the entire joint from the formation of the exudate. In this we think that he and his followers are in error. We regard the exudate as a mere symptom, and think that it plays a very small part in the extension. In a few of our specimens layers of fibrin have been observed on the cartilage and on the synovial membrane, but generally they appear to be an effect and not a cause. The older anatomists used to describe the synovial membrane as a pouch — instead of a tube — running over the cartilages, but their view has been abandoned. The synovia runs a short distance out on the surface of the cartilage, and both at the surface and deeper in, the structure of the one gradually shades off into that of the other. The transition from the branching connective tissue cells of the synovia to the true cartilage cells is also a gradual one. In other words, there is no essential difference in the basic structures of the two tissues, and recent writers[1] say that immobilization causes the synovia to encroach upon the cartilage and to spread out over its surface, only to recede again when motion has been resumed. Lack of function causes a tendency in the cartilage to revert to fibrous tissue. We find as one of the early evidences of the degeneration of the cartilage in tuberculous disease, an exaggeration of this phenomenon, an encroachment of the synovia and a distinct fibrillation of the cartilage itself. In the deeper portion the direction of the fibers is perpendicular to the surface, but more

[1] Nathan: Journal of the Am. Orthop. Assn., August, 1909; quoting Reyer, Fisher, Hammer, and Braun.

Bone tuberculosis. Upper end of tibia. Joint not involved. X-ray picture showing two sequestra. This case was variously diagnosed as tuberculosis, syphilis, and old osteomyelitis. A microscopical examination of the tissue removed showed typical tuberculosis. The black smear is mercurial ointment.

superficially the fibers run parallel to it, and in places are frayed out, with their free ends waving loose. These frayed ends, in our opinion, must have been mistaken for deposits of fibrin. The transition from the fibers to the homogeneous cartilage structure is often so gradual that one can not tell where the one ends and the other begins.

Sometimes this fibrillation seems to be the only evidence of the degeneration. Sometimes the cartilage is more or less broken up, as if the tuberculous tissue beneath were bursting through it, and holes can be seen in it, filled with inflammatory tissue. In some of our sections the cartilage at the sides is fibrillated, further in it is broken up, and still further its structure is blurred. Occasionally we find a layer of inflammatory tissue lying on the surface, but tuberculous tissue in this situation is very rare. We conclude from a study of our specimens that no serious damage is ever

924. Tuberculosis of the metacarpo-phalangeal joint, synovial type. The tuberculosis spreading from synovial membrane has attacked the bone at its articular surface. X about 10 diameters. Section from phalanx.

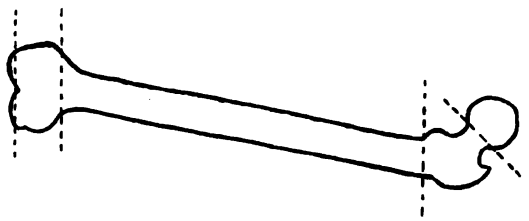
wrought to the joint cartilage in tuberculous disease except that which is done indirectly by the involvement of the bone marrow beneath it.

Upon opening a tuberculous joint we may find the cartilages smooth and apparently normal, especially in synovial disease in its early stages — sometimes also in its later course — but as a rule in synovial disease an erosion will take place beginning at the sides of the cartilage and spreading inward. In bone disease the cartilage over the affected bone is mottled, thinned, and more or less eroded in spots. Sometimes, on the other hand, the smooth cartilage will give no idea of the extensive bone disease beneath it.

Through all our specimens the entire pathological process can be translated as nature's effort to abolish function, to deprive the joint of motion, and, as we have mentioned, this is never successful in adult joints. In them the ankylosis is always fibrous, and, therefore, motion is always possible. This attempt to abolish motion in the joint is suggestive. We regarded it as nature's effort at cure, and in our earlier work were wont to ascribe to motion in a joint the causative role in joint tuberculosis. Further study convinced us that while our theory contained a germ of the truth, it could not cover all the phenomena of bone tuberculosis, and that some other cause must be sought. We found this in the histological structure of the joint tissues.

The bone structure itself, the trabecula, is never involved in the tuberculous process either early or late. It, as well as the cartilages and ligaments, escapes tuberculous invasion, and, like them, suffers only by interference with its nutrition. All three play a passive role in the disease. Virchow's original definition of a tubercle confined it in its occurrence to connective tissue, but there must be some peculiar element in the connective tissue that renders it liable to invasion. Not all connective tissue is vulnerable. Primary involvement of pure fibrous connective tissue is very rare, if it ever occurs. Bone structure proper in the last analysis is connective tissue plus lime salts, and cartilage a fibrous structure plus a cement substance. Many of our specimens show this fibrous structure clearly. The synovial membrane is also a connective tissue structure.

In bone tuberculosis, the only tissue that is affected directly by the disease is the marrow, and in the marrow the disease spreads, not in the ordinary yellow or fatty marrow found in the shafts of the long bones, but in the red marrow of their cancellated ends (as also in the red marrow of the vertebræ, the short bones, the sternum, the ribs, and the cranial diploe) hence in the long bones *always in the vicinity of the joints.* Exactly what the character of the cells is that makes the red marrow a field for the spread of the disease, we do not know; but we assert that where this marrow is found in bone the bone is subject to tuberculous invasion; and where it is not found, there the bone is immune, or almost immune, to a purely tuberculous infection. Any operation that causes the epiphyses of the long bones to lose their cancellous structure and to become compact bone, that is, any operation that causes the marrow to change from the red or cellular variety to the yellow, will cause the disappear-



Femur, showing amount of bone sacrificed by the classical method of resection and by our method.

ance of the disease at that spot. Hitherto, many writers have called attention to this vulnerability of the epiphyses of the long bones, and have attempted to explain it on various hypotheses, but no explanation has ever been accepted as adequate. Some have said that it was due to the greater blood supply; but abundant blood supply is no cause for tuberculosis. Others claim that congestion following a strain or injury is the cause; but congestion (Bier treatment) is one method advanced for healing the disease, and all investigators[1] admit that severe injuries such as fractures and dislocations are not followed by joint tuberculosis. Others again would have us believe that there is some peculiar arrangement of the capillaries here. Our explanation is simple and comprehensive, and goes far to clear up many facts hitherto regarded as obscure.

Of the synovial membranes, classed among structures of the lymphatic system,[2] the smooth fibrous portions are probably not the ones liable to primary invasion, but rather the fringes in the recesses of the joint, where there is found a distinct epithelioid covering (Quain) or epithelium (Gray), and where the smaller, non-vascular, secondary fringes of Rainey (synovial villi) consist for the most part of small round cells with granular protoplasm. Throughout the body it is the connective tissue structures containing epithelial, epitheloid, or lymphoid cells that are prone to invasion by tuberculosis, *and the tissues of the joints are no exceptions to this rule.*

We say of the synovial membranes that any operation which deprives them absolutely of function causes them to lose their distinctive structure, and to change to fibrous connective tissue, and hence cures the tuberculous disease in them.

Let us see where all this leads, and how it agrees with the known facts of the disease.

In the first place, the beneficial results of rest in tuberculous joint disease have long been known. Now, rest means abolishing of function; and deprivation of function means the loss or partial loss of the characteristic structure of a tissue and its replacement by connective tissue of a low grade of organization. Consequently, rest means to the two elements of a joint liable to tuberculosis a loss of their peculiar cellular elements and consequently a withdrawal of the field for the spread of the disease. Pain is conservative, and unaided nature *rests* the joint by making motion painful. With apparatus or plaster-of-Paris or rest in bed we simply aid nature.

As a corollary to this it may be said that growing children are more active than adults, they use their joints more; consequently, they are more subject to joint tuberculosis than adults. Again, their bones contain more red marrow.

When we turn to the operative treatment of joint tuberculosis, however, we see the truth of our theory most plainly, and in dealing with this phase of the subject we include only adult joints. There is something in the resisting power of children that permits a cure of their joints by conservative treatment, often with a fair range of motion. Amputation at or just above a tuberculous joint (we speak always of one that has not been secondarily infected by pus germs) cures the disease, even if all the tuberculous tissue be not removed. It cures immediately by abolishing function, for abolishing function means a change in the character of the marrow and of the synovial membrane. An amputation at the hip cannot eradicate the diseased tissue from the pelvis, but it will cure tuberculosis of the hip, nevertheless. Amputations, however, are rarely resorted to except in desperate cases. Resection is the usual operation, and the best authorities hitherto have taught that one should go "wide of the disease" and eradicate every particle of infected tissue. This is an impossibility, and even those who teach this doctrine can not practice it. One could never be sure in re-

[1] Krause, König, etc.

[2] Quain's Anatomy.

secting a joint, that one had removed all tuberculous tissue, yet if bony ankylosis was secured, with primary union of the wound, *the joint was cured.*[1] In other words, the disease was cured by abolishing the joint. As soon as the joint was destroyed, the characteristic elements of it that offered a field for the disease, the red marrow and the synovial membrane, disappeared, and the disease died out.

If this statement is true, then a joint that can be destroyed can be easily cured by a resection, and one that cannot be destroyed cannot be easily cured. Let us see if the facts bear us out.

After a resection of the knee, if ankylosis be obtained, the portions of the epiphyses left behind gradually lose their cancellous structure, and the marrow in them changes from red to yellow. The femur and tibia become one bone, and in course of time a regular medullary canal is established through the entire shaft.[2] The knee is the joint that is most easily cured of tuberculosis by a resection. It is the one joint in the body in which firm bony ankylosis can be almost uniformly secured provided the tissues are capable of repair.

We have tried out this theory in three cases of knee-joint tuberculosis. The first, done a year ago, was a case of synovial disease that had lasted for five years under conservative treatment. A mere shaving was removed from the femur and tibia, and no dissection of the synovia was done. Firm bony ankylosis was obtained, and the patient was cured. The other two operations were done respectively three months and one month ago. Both were done in defiance of all rules hitherto laid down for operation in such cases, and in accordance with the theory elaborated in the laboratory. Our confidence in this theory is attested by the fact that the first was a private patient, a school teacher, who had had his joint lesion for about seven years. When seen first, five years ago, he had a typical synovial tuberculosis of the knee, and refused operation. Recently the disease had grown much worse, and the bones were evidently involved. At operation the synovial membrane was found badly affected and the cartilages eroded at their margins. We sawed off the tips of the condyles and chiseled off the cartilages of the tibia (under the inner we found a small pocket of pus), the inner surface of the patella, and a corresponding area from the trochlea of the femur. Only enough of the soft parts was sacrificed to give access to the bones. Not even the lateral nor the crucial ligaments were cut. The bones were then brought into place, and the wound was sewn up tight, except for a drain that was left in for twenty-four hours, and all the tuberculous synovial membrane was left behind. He has made an uneventful recovery; the wound is healed; bony union has taken place, though it is not yet firm; and the patient, free from pain, is walking on the leg encased in plaster-of-Paris. It was shortened by the operation hardly three-quarters of an inch. Examination of the tissues removed showed typical tuberculosis.

The other operation, done seven weeks ago, can not be quoted yet as final. In this case the saw revealed a bony focus in the external condyle, about one centimeter in diameter. We removed a bare centimeter from the condyles, about half as much from the tuberosities, and none of the soft parts whatever except a small clipping for diagnosis from the synovial fringe. We dissected out the patella also, and sewed the wound up tight without drainage. His further progress has been uneventful.

The tarsus. If, in a case with a focus in one of the small bones, the bone be excised before invasion of the joint, that is, if every bit of infected red marrow can be removed before the synovia becomes infected, the disease can be quickly cured. If a joint of the tarsus once becomes infected, it is well known that almost invariably (if not invariably) only an amputation will suffice to cure. In other words, in the complicated series of joints found here no

[1] The fact that in a number of our own resections a cure had followed our destruction of the joint, although we had not removed all tuberculous tissue, had seemed natural enough, but on the old theory of operating was hard to explain.

[2] Ollier, Dict. encycl. des sciences médicales, Paris, 1870. Ankylose. Page 191. "Les os une fois sondés, il s'opére une raréfaction de leur tissu au niveau de l'articulation; les deux canaux médullaires s'abouchent et ne forment plus qu'un canal unique. Toutes les parties placées en dehors du mouvement par suite de l'ankylose s'atrophient. Les saillies situées autour de l'articulation et servant d'insertion à des muscles, diminuent et même disparaissent. Ces observations prises sur des piéces du Musée Dupuytren se rapportent aux ankyloses osseuses."

Pl. Mauclaire. Nouveau Traité de Chirurgie, Paris, 1909. Ankyloses. Page 235. "Tantôt c'est une fusion osseuses complète à la fois périphérique et centrale; aussi la cavité articulaire a disparu, et les os sondés sur toute leur étendue ne font plus qu'une masses unique. La substance spongieuse des épiphyses peut disparaitre; les vacuoles dont elle est parsemée s'agrandissent, et les canaux médullaires des deux extremités osseuses ankylosées peuvent se réunir de manière à ne présener qu'un canal osseux médullaire commun et continu d'après Lacroix."

operation has been devised that will cause complete ankylosis, and change the character of the marrow or cause the synovial membrane to disappear.

The hip. No operation has ever been devised that can eradicate the tuberculous tissue from a diseased hip. The diseased acetabulum can only be scraped; the pelvic bone offers no field for extensive excision; yet the results of resection in this joint are excellent. Why? The operation removes the head of the femur, dislocation takes place, *the joint is abolished*, and the upper end of the femur is slung by fibrous structures upon the dorsum illii (articulation par suspension, Ollier). Hence the uselessness of the extensive dissection of the synovial membrane, and the removal of the head, neck, and trochanters of the femur—Langenbeck's operation. Removal of the head alone is all that is necessary to secure dislocation. We have done this operation also, of simple removal of the head, and can quote two cases in which the head of the femur was badly diseased and showed tuberculosis under the microscope. Both patients were cured with good function.

The wrist. What has been said of the ankle is true of this joint.

The elbow. One of two results is secured in resection of the elbow. If bony ankylosis takes place, then what we have said of the knee applies here. If a flail joint be secured, the result is much the same as in the hip. There is really no joint left. The two bones are simply tied together by fibrous tissue. Whether any red marrow is left behind in these cured flail elbows we are unable to say.

Tuberculosis of the phalanges (spina ventosa). A photomicrograph of our only case of tuberculosis of the finger accompanies this essay. An amputation was deemed necessary to cure the disease.

In our case of disease of the metatarsophalangeal joint of the great toe, a resection cured the disease in about one year.

Parenthetically it may be said that we have seen so-called subperiosteal resections done on a number of cases of spina ventosa in children with thorough dissection of the infected sinuses. Primary union of the wound was thus secured, and the disease appeared to be cured, but as soon as the bone had been re-formed (with its red marrow) the process broke forth with renewed vigor.

Although none of our specimens is from the spine, we might add that no operation has ever been devised for promoting ankylosis in these joints, and the extremely bad prognosis in this disease in adults is well known.

What does all this mean? It means that in knee-joint resections, instead of removing two inches of bone, and exposing the patient to a long and exhausting operation, we simply open the joint and remove enough bone to secure ankylosis, paying no attention to the tuberculous tissue left behind, for we know that it will shrink and disappear when the joint has been destroyed.

It means that in hip resections the operation of sacrificing the head, neck, and trochanter of the femur, and attempting the impossible task of eradicating all tuberculous tissue, will fall into disuse, and that we shall adopt another operation that is quicker, safer, and much less mutilating.

It means that the widespread custom of curetting a tuberculous ankle or tarsus or any other joint will be relegated to the obscurity it so richly deserves. It means, in short, a revolution in our ideas of treating joint tuberculosis.

In children, conservative measures will often suffice for a cure in accordance with this theory, and in operations on adults our principle should be the guiding one.

To sum up, then:

1. Only two tissues in a joint, the synovia and the red marrow, are subject to tuberculous disease.
2. Their presence is dependent on function.
3. When the joint has been deprived of function, they disappear.
4. When they disappear, the disease dies out.

Therefore, to cure a tuberculous joint deprive it of function.

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ARTIFICIAL RESPIRATION

FORCED RESPIRATION, WITH COMMENTS ON THE CABINET METHODS OF SAUERBRUCH, MEYER, AND OTHERS; ALSO A NEW METHOD IN THORACIC SURGERY

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ARTIFICIAL respiration, prior to the year 1887, consisted principally of the methods suggested and presumably utilized by Marshall Hall in 1857, Sylvester in 1858, and also according to Professor E. A. Schäfer (1), by Dr. Howard in 1868.

Since then in 1890, "the prone pressure," or as it might be termed, the Schäfer method, coming in the same category, might be added to the list.

Undoubtedly it was owing to the experiments and failures of the surgeons of the Dr. Hall period, about 1857, previously of LeRoy of France, Monroe, Dalyrumple, and others of England, that Mr. John Erichson in 1845, concluded that (2) "In spite of all the improvements and modifications of the technique, and the methods of inflation by bellows, the instrument never again came into favor, and was speedily forgotten, when the postural methods came into use."

Marshall Hall was especially severe, and justly so at that time. He considered it unwise and dangerous to attempt the forcing of air into the lungs by any mechanical means in efforts to save human life, and from 1857 to 1887, the medical world agreed with him.

On July 23, 1887, there came a positive demonstration against his decree; a human life, which could not be saved by the then known postural methods, was saved by forcible respiration by means of the bellows, which the medical profession had rejected for 30 years as impractical. This case was reported in the Buffalo Medical and Surgical Journal, November, 1887 (3). Within about three months following, Professor Dr. Boehm of the Allgemeines Krankenhaus, Vienna, Austria, saved the life of a patient, by the same method (4, 5, 6).

Other cases quickly followed (5, 6), and were of such a nature as to indicate that a new epoch in artificial respiration had been established in practice.

The third epoch is already here in the cabinet *negative pressure method* of Professor E. F. Sauerbruch, of the University of Marburg, Germany, who has given demonstrations of great value in its application to surgery of the thoracic cavity (1).

Suggested Classifications

THE FIRST DIVISION OF ARTIFICIAL RESPIRATION

This consists of postural methods, and movements of the limbs of the body, with intermittant pressure applied at different parts, or those originated by Marshall Hall, Sylvester, Schäfer, and others.

THE SECOND DIVISION

Forcible measures of instrumental control, the forced respiration, and now by some termed the positive pressure method, was first practically, systematically, and continuously for some years, utilized in saving human life by the author.

THE THIRD DIVISION

The diminished atmospheric pressure system with the cabinet or small moderately tight room, the so-called "negative pressure" system of Professor Sauerbruch.[1]

DETAIL OF METHOD OF FIRST DIVISION

In a few words I will attempt to indicate these methods.

That of Marshall Hall is produced by pressing upon the back and shoulders, with the body in the prone, face down position, producing the expiration; the body is then rolled to the lateral position by traction upon the arm and shoulder, to produce the inspiration. Repeat at respiratory intervals.

The Sylvester method is produced by drawing the arms of the patient when on his back upward over the head with a steady pull, to produce inspiration, by then lowering them to the sides of the thorax and adding a firm constrictive pressure, the expiration is produced. Repeat.

The Howard method. With the patient on his back, pressure is made over the lower part of the chest, retained a few moments, producing expiration; then relaxed, permitting inspiration. This is repeated to supply the requisite number of respirations per minute.

The Schäfer method, or as he terms it, "the prone pressure" method, is described by him as follows: (1) "The operator kneels or squats by the side of or across the patient, places his hands over the lowest ribs, and swings his body forward and backward, so as to allow his weight, alternately to fall vertically on the wrists and be removed; in this way hardly any muscular exertion is required." It is "completely efficacious and capable of effecting an air exchange greater than that produced in normal respiration," and also, "in cases of drowning there can be no question that the method is always indicated."

Its advantages are: "First, that it is fully efficient. Second, that it can be performed without fatigue by a single individual. Third, that it is simple and easily learned. Fourth, that it allows the tongue to fall forward and the mucus and water to escape from the mouth, so that the tendency of these to block the passage of air is altogether obviated."

An evident advantage in favor of the patient in a serious case over the Marshall Hall method, is that it conserves his energy by lessening the movements of the body, no lateral position being required. However, forced respiration has advantages over all postural methods in this respect. The postural methods are the great emergency methods when no instrument is at hand, but as we will see there is a field and a wide one for all the methods of artificial respiration.

There are other methods, but the above are the most utilized and are classed with the *first division* of the subject.

DETAIL OF SECOND DIVISION

This consists of the use of apparatus, by which atmospheric air alone, or combined with oxygen gas or an anæsthetic, is forcibly driven into the lungs, under proper regulation, through a tracheotomy tube, an intubation tube by means of a face cup or mask, which is made to tightly fit the contour of the face, inclosing the nose and mouth, to prevent the escape of air, or by the positive pressure cabinet, which in reality is a face mask on a large scale and in which the air must be rhythmically presented forcibly, and released, as in the principle of forced respiration.

This is accomplished by suitable bellows, single or compound, compressed air from a

[1] The positive pressure cabinet addition of Professor Willy Meyer, to the negative of Sauerbruch, does not alter our divisional system, even if mingled with the other (19).

cylinder or pump, an electric or hand blower, or other methods by which a steady column of air, of sufficient volume may be furnished under suitable pressure and control. (I do not specify the double cylinder pumps and other devices prepared for insufflation and *aspiration*, as in practice they have not proved safe or practical.)

In this division therefore the air is rhythmically presented so as to simulate natural respirations. It has been used successfully by the author on human beings of ages from eighteen days to adult life, and from a few hours to three or four days and nights.

It was through the incentive given to artificial respiration by the introduction of forced respiration (second division), by the methods of the author in 1887, when we first knew absolutely that we could respire for hours and days for human beings, with a perfection no more than equaled by physiological respiration, that the surgery of the thorax, through its utilization, became a practical possibility. Dr. F. W. Parham of New Orleans, La., was the first one to successfully remove a sarcomatous growth from the walls of the thorax, using forced respiration by the so-called "Fell-O'Dwyer" method for that purpose. The forced respiration prevented the collapse of the lungs and pneumothorax, the operation was completed, the chest walls closed with inflated lungs, and complete recovery of the patient ensued (18).

DETAIL OF THIRD DIVISION

This will call for a short preliminary statement to clearly appreciate its mechanism. Respiration is made possible in the thorax of the *vertebrata* by a partial vacuum existing in the pleural space, after the contraction of the lungs in expiration. This is represented by a varying negative pressure of 4 to 10 mm. of mercury. The surgical opening of the thoracic cavity without forced respiration to keep the lungs in an expanded condition, or the negative pressure method of the Sauerbruch cabinet, which accomplishes the same results through the retention of auto-respiration, is therefore a serious and dangerous procedure, as the external atmospheric pressure otherwise usually causes instant collapse of the lungs, producing dyspnœa, displacement of the thoracic viscera, shock, and death.

Professor Sauerbruch conceived the idea of having the body of the patient within a chamber, the air within rarefied to approximate the negative pressure in the pleura of 4 to 8 mm. Hg., while the head of the patient was outside of the chamber, permitting the respiring of normal pressure atmosphere. Under such conditions, by varying the negative pressure as needed, the thorax could be opened within the rarefied chamber, without the collapse of the lungs, and surgical work conducted with almost the same degree of confidence as operations on the abdomen. When we consider the wide range of pressure, from the compressed atmosphere of the engineer's foundation caisson, to the rarefied air of the mountain top, which the human body readily withstands, it is seen that the comparatively light rarefaction of the air of the negative chamber will not interfere with the work of the surgeons within the cabinet.

I believe it may be assumed that the negative pressure method could be carried out in a moderately sized, approximately air tight room built within a hospital or without, provided with apparatus of sufficient exhaust volume to insure an interchange of incoming filtered air to provide a pure supply for the use of the operators and the patient, and yet control properly the negative pressure. The necessary requisite is that the exhaust blowers be of sufficient capacity to quickly lower the pressure in the room. By valves suitably located and controlled for the ingress of the atmospheric air the pressure can be modified and controlled to a great nicety. Reference must be made to the admirable paper of Professor Sauerbruch (1) in the September 5, 1908, number of the Journal of the American Medical Association, to appreciate what a great advance in artificial respiration his negative cabinet work has given us.

At this point we must bring in the fact that not only have we negative cabinet, but also positive cabinet methods, and they are multiplying so rapidly that it will not be long before the exact value of all of these different methods will be practically known.

As to the positive pressure cabinet of Pro-

fessor Willy Meyer (19) within the negative cabinet, to be available for positive respiratory work, the air must alternately be raised to the degree for inspiration, and released for the expiration if it is actual positive or not passive respiration. If we have the positive at +3 mm. Hg. and the negative at −3 mm. Hg., we have a differential of 6 mm. Hg., which is necessary to the conditions of auto-respiration, although both positive and negative factors enter into the production of the respirations. If we produce respiration by the positive cabinet alone the pressure must be raised to about plus 6 and quickly released to zero the same as positive respiration with the face mask or intubation tube. The question as to whether the small cabinet of Brauer (7), or the larger experimental one of Doctors Janeway and Green (8), or the yet larger one of Dr. Meyer (19) is better for positive pressure work than the face or air mask when properly utilized (9) is an interesting one. The principle involved is, it seems to me, essentially the same, except that the air is more equably presented in the cabinets than with the face or air mask, although the positive pressure would necessarily be the same in all.

As this paper partakes somewhat of a historical nature it may be proper to cite some features of a discussion which occurred eighteen years ago, when we were all groping in the dark in our consideration of this subject (10). Dr. John O'Dwyer, whose memory we revere, expressed the opinion that "In forcing air through the mouth or nose of an insensible patient, the tongue, unless secured, is almost certain to cause obstruction, or the vocal chords may be forced together by the inrushing air, and act as a valve, as in paralysis of the abductor muscles, because there is no expansion of the glottis as in normal respiration. This theoretical objection was contrary generally to my experience at that time, as shown by the published histories of cases.

In case 11 the face mask was used for four hours, in case 15 for seven hours, in case 17 for two hours, case 19 two hours, case 21 seven hours, case 22 four hours, case 24 five hours, case 25 two hours, and in all of these cases for the time mentioned, there was absolutely no interference with the air passing directly to the lungs. It has been disproven in many cases since then.

CLAIMS OF DIFFERENT METHODS

Some one has said, "It is comparatively of little consequence whose mind conceived the thought. Inventors often think of the same thing. No invention or discovery is of much value, however creditable to the mind that originates it, until it is developed and put into such shape as to become practically available, so that the conception may be seized upon by other minds, and wrought into a tangible reality."

Marshall Hall, Sylvester, and Howard put their discoveries into such shape that the world has utilized them, saving thousands of human lives. Professor Schäfer has given us apparently the best method of the first division.

The author must refer to his published papers for a record of his results, which are outlined in the partial bibliography of the subject appended to this paper.

Professor Sauerbruch has also apparently demonstrated the value of his discovery, that as with the others, his method can be generally utilized and advanced to its worthy niche in the temple of medical progress.

COMPARISON OF EFFICACY BETWEEN THE FIRST AND SECOND DIVISIONS OF ARTIFICIAL RESPIRATION

In the author's first case (3) Mr. P. B. had taken grs. xx of morphine, and some chloral hydrate, which was all absorbed. The Sylvester method and every known means to resuscitate were unsuccessfully applied, forced respiration was applied under great disadvantages, and the life of the patient saved. The period of forced respiration was 2½ hours.

The second case of author, which occurred December 10, 1887, was really made a test case between the Sylvester method and that of the author. Mr. J. A. V. had taken two ounces tr. opii.

Artificial respiration by the Sylvester method was faithfully kept up until it was clearly demonstrated that the life of the patient could not be saved, after which the author's apparatus devised for use on man was utilized for twenty hours, saving the patient's life.

In comparing these two divisions there are other important factors which have a bearing upon the subject. Dr. Carlton R. Jewett, of Buffalo, N. Y., after witnessing the case of J. B., January 24, 1888, stated (6) "The simple institution of artificial respiration (first division) through the bodily movements required, might have proved disastrous to the patient, owing to his weak condition from loss of blood." In a paper read before the New York State Medical Association in 1888 (6) I said, "The contrast between the two is very noticeable. In artificial respiration the patient is tugged, squeezed, and rolled about, according to the method employed; while in forced respiration, often when *conscious* he is entirely *passive*, and will lie for hours without appearing uncomfortable, as long as the latter is properly kept up." This passivity or inhibition of the active auto-respiratory factors, diaphragmatic and thoracic, has from the first been noted in my work with tracheotomy, the face mask as well as with the intubation connection.

Imagine the keeping up of any of the postural methods, even the Schäfer, from Tuesday morning, 2 o'clock, until Friday morning at 8 o'clock (17), nearly eighty hours, before the life of the patient was saved (17). Another case may be cited, H. J. W. (16). In this case the forced respiration was begun, upon a Tuesday over 16 years ago, at 9 A. M., kept up until Wednesday 11 A. M., again utilized 2 P. M. Wednesday until Thursday, 9 A. M., and finally used, beginning Thursday, 7:20 P. M., and again kept up continuously until Friday night at 10 o'clock, the patient making a good recovery.

COMPARISON OF EFFICACY BETWEEN THE POSITIVE AND NEGATIVE METHODS

In history it is rather early to attempt a comparison between these divisions, although much of interest may be stated. We must not lose sight of the fact that outside of thoracic surgery, there is a wide field of cases more suitable to forced respiration than to the postural methods, and some in which it is questionable whether the negative system could be applied. In cases where the respiratory center is paralyzed by poison or shock, we may question whether the negative method would be applicable.

Herein lies one of the great and important advantages of the forced respiration over the negative or the *auto-negative*. This is a tentative proposition, as I am not experienced yet in actual negative work. Take a patient *in extremis*, a condition we may often find in thoracic surgery.

Negative cabinet respiration means auto-respiration, and calls upon the already overtaxed and weakened nerve centers to formulate the important respiratory impulses, in other words negative respiration decreases this energy while forced respiration conserves it, and may mean in many cases the difference between success and failure, as a life saver.

COMBINATION OF NEGATIVE AND POSITIVE METHODS

Both Drs. Janeway and Green (8) and Dr. Willy Meyer mention the possibility of artificial respiration being kept up by their respective positive cabinet methods, the mechanism permitting the air supply to be suddenly increased to produce the inspiration (19) and suddenly lowered to atmospheric pressure to allow expiration to take place. Whether they have obtained as complete control of the respirations as I have with my apparatus I am not prepared to state.

It can safely be assumed that with my apparatus similar to this, the utilization of the positive with the negative cabinet is feasible and practical, and so far as its work is concerned it is not an experiment.

THE LABORATORY AND OTHER APPARATUS OF THE AUTHOR

I have been fortunate to secure the original *laboratory* bellows (Fig. 10), which, when I was an assistant to Professor W. H. Mason, was used in the Physiological Laboratory of the University of Buffalo, N. Y., years 1880–1882. It was never thought to be a life saver.

The apparatus with which the first life was systematically saved by forced respiration in 1887 (Fig. 11), is the property of the Buffalo Historical Society, and has been kindly loaned

Fig. 1. Double bellows or air supply device.
Fig. 2. Air valve, with oxygen and anæsthetic tubes.
Fig. 3. Air cup or face mask, intubation tube, etc.
Fig. 4. Oxygen supply apparatus.
Fig. 5. Anæsthetic container.
Fig. 6. Anæsthetic control valve.
Fig. 7. Rubber manometer.
Fig. 8-8. Three-way connections.
Fig. 9. "Maelzel" metronome.

to me for exhibition at this meeting. It was devised for use in laboratory vivisection work, and was provided with a two-way valve (Fig. 12) and cannula combined, connected by a rubber tube with a bellows. The stop-cock of the valve turned one way, allowed the air to pass into the lungs from the bellows; by turning it a quarter turn the air expired was made to pass out through a fenestrum in the side of the valve. This opening was so small that only a portion of the expired air could pass through it, so that a large percentage had to escape by the side of the cannula.

This was a fortunate matter in this first attempt to save a human life by this method of forced respiration, as it allowed the expiration to become complete, and make the respiratory work effective. The difficulties arising from the incompleteness of this apparatus were such as to cause to be devised a valve on the cornet-piston order, to be used for life saving purposes (Fig. 2). This valve offered absolutely no interference with the auto-expiration, but rather assists it, as was afterward learned. In a paper on forced respiration of November, 1887 (3), these words were used, "A valve so arranged that the surgeon can completely control the passage of the air from the bellows to the lungs, and when free will permit the air to pass readily out of and into the lungs, or in other words, so that the

Fig. 8 A. Air valve of author (1887).

surgeon need only manipulate the valve during the inspiration," or insufflation.

In the twenty-two years since these words were written, there appears no good reason to change their import. However, it was necessary to provide another outlet in the valve before it would be completed even for simple respiratory purposes (without gas, oxygen, or an anæsthetic), and to arrange it so that the double bellows or other means which produced

Fig. 3 A. Air cup or face mask of author, edges faced with hard wax.

Fig. 10. Vivisection bellows, University of Buffalo, 1880.

a steady column of air, could work *continuously* for two important reasons:

First: To utilize the movements of the bellows as an ever present and constant guide for the time of both inspiration and expiration, and as long experience has shown, providing a better and safer factor in the prevention of overdistension, than a mercurial manometer, as a convenience in the working of the bellows, and to make the work practically simple (6).

RHYTHM OF THE RESPIRATIONS

In considering the question of the rhythm of the respirations and necessarily of the *safety* of the entire procedure, it was found natural and much easier to work the bellows about ninety to one hundred and eight times per minute than sixteen to eighteen times.

Fig. 11. Vivisection apparatus of author, with which his first life (human) was saved, 1887.
Fig. 12. Brass control valve of No. 11.

Fig. 13. Author's rubber lungs for demonstration. New York State Medical Association, 1888.

The attempt to have the bellows large enough to simply provide one movement to a complete inspiration, makes them cumbersome, uncertain in action and dangerous when compared with the plan adopted from the first work that brought satisfactory results in this field.

Second: The air was under constant pressure in the air valve, with steady working of the bellows. The instant the piston was pressed down full stroke the air was free to enter the lungs and steadily insufflate them during the period of three movements of the bellows in the adult; the piston being released for the same time gave the period for expiration. This provided sixteen to eighteen respirations per minute, supplying the needed quantity of tidal air. By this system the respirations may be varied at will, and utilized with any constant method of supplying the air. In successfully breathing for an infant eighteen days of age, one movement for inspiration and one for expiration provided thirty-two respirations per minute.

With an air-tank or constant blower gauged in quantity and pressure, a "Maelzel metronome" (Fig 9), as used by musicians, may be used. When set at eighty-four or ninety-six strokes per minute, and the one-two-three counts made to correspond to it, the safety of the work is assured.

Instead of using a mercurial manometer as a safety factor, and which by the way, is very unsatisfactory on account of the small range and irregularity of movement of the mercury, a rubber manometer (Figs. 7, 13, and 14) on the plan of the artificial lungs described in 1888, is recommended (6).

Fig. 14. Single lung arrangement, which may be used in preference to the mercurial manometer.

Fig. 15 A. Arrangement to illustrate *forced negative respiration.*

GREAT ADVANTAGE OF THE AIR VALVE

This valve (Fig. 2) gives a better control of the respiratory movements of the lungs for operative work in the cavity of the thorax, than any other method with which I have become acquainted. It is true, that in the negative auto-respiration of Sauerbruch we have the incursions of the lungs taking place in the natural manner, i. e , they expand and contract as in the natural pleural space, but not so as to accommodate the surgeon in his labors. They are continually in his way, but of course may be "mopped" out of his operative field by the pledgets of gauze. However, this interferes with respiration, which is a serious matter.

With the valve method as we will show we can control them as follows. The respirations may range from five to fifty per minute; at will they may be made as long or as short as we choose; adapt them to the degree of cyanosis of the patient; follow the auto-respirations, by immediately changing from a partial insufflation to follow an auto-expiration, or *vice versa;* increase the insufflations and decrease the expirations, all of which have been found expedient in closed chest cases on living human beings.

In surgical cases of the thorax, we may collapse the lungs almost completely; use short, quick respirations to keep them out of the field of the surgeon in a manner that cannot be as satisfactorily effected by the auto-respirations in the use of the Sauerbruch cabinet, and when the surgeon is ready to close the thorax, at the termination of the operation, keep the lungs completely inflated or to any extent for any length of time, until the final closure stitches have been taken, and the thoracic cavity placed in physiological respiratory order again. To be certain that this has taken place, we may keep up the forced respiratory work with the closed chest, until the influence of the anæsthetic has well passed away, before removing our intubation or tracheotomy tube from the neck of the patient.

THE VALVE EXHAUST IN EXPIRATION

A valuable feature of this valve (Fig. 2), which has never before been mentioned, and

Fig. 15 B. Arrangement to demonstrate *forced negative respiration.*

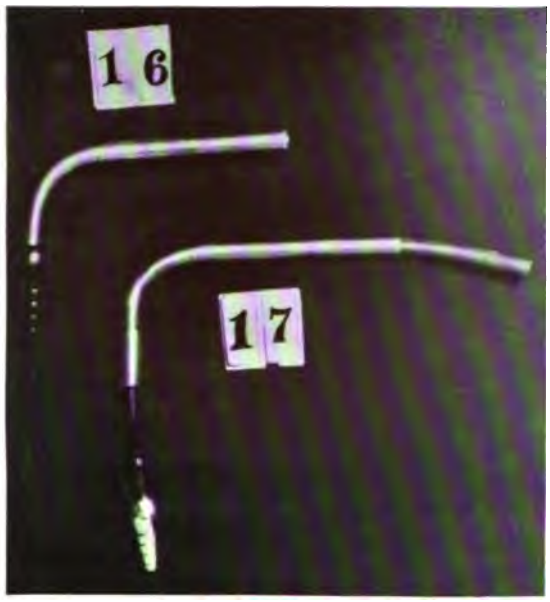

Fig. 16. Intubation tube of Dr. O'Dwyer, 1884.
Fig. 17. Intubation tube of author, 1908.

Fig. 18 Tracheotomy tube and rings of author, 1887.

which experience has proven to be of marked value in aiding interchange of gases, is the very slight exhaust, equivalent to about one-third mm. of mercury which always takes place if desired, during the expiration. It aids the auto-expiration, but is so slight as not to interfere with the auto-inspiration or expiration at any time. This may seem paradoxical but in practical reality is as stated.

UTILIZATION OF OXYGEN GAS

This is a necessary factor in forced respiration, the Williams (16) and Archer (17) cases demonstrating the absolute need of it in extreme cases. It is through the air valve that it is supplied to the patient. The quantity is controlled by the stop-cock of oxygen cylinder (Fig. 4), the gas passing through a wash bottle into the air valve only during the insufflation. The practical administering of it with the air valve presents no difficulties whatever.

UTILIZATION OF ANÆSTHETIC WITH AIR VALVE

The latest addition to the valve is the anæsthetic tube and the method by which the anæsthetic is gauged and passed into the lungs with the insufflation. This tube receives the anæsthetic vapor, either chloroform or ether, from a three-necked "Woolf" bottle (Fig. 5), which may be partially filled with absorbent cotton. in the following manner. It is borne in mind that the air from the tank or bellows is constantly passing out of the air valve under pressure. About ten inches from the air valve, and between it and the bellows a three-way connection (Fig. 8) is placed, uniting the bellows, air valve, and the "anæsthetic container" by means of rubber tubing. The anæsthetic (and cotton) is placed in the bottle, the air from bellows passes through glass or metal tubing into or over it according to the anæsthetic used, through one neck of the bottle and has an exit through the middle neck which connects with the anæsthetic tube of the air valve. The third neck is utilized for filling and emptying the bottle and is supplied with a common cork stopper. At all times both during the inspiration and expiration the anæsthetic is being vaporized by the air continually passing into it. When, however, the piston of the valve is pressed down to its full extent, the inrushing air carries with it into the lungs the vaporized anæsthetic in sufficient quantity to anæsthetize the patient.

A control valve (Fig. 6) is placed in the tube

between the "Woolf" bottle and the air supply to regulate the quantity of the anæsthetic or cut it off altogether.

The anæsthetic may be used with intubation, tracheotomy, or face mask, and with the latter is applicable for general anæsthesia. I believe I have arranged a method of utilizing anæsthetics in connection with forced respiration that is both practical and easily applied.

INTUBATION TUBE, TRACHEOTOMY TUBE, FACE OR AIR CUP

The intubation tube, tracheotomy tube, and what I will now term the air cup, instead of mask, are all of positive value in forced respiration. The apparatus is so arranged that it can be readily attached to one or the other.

In emergency cases the air mask or cup has been of great value in sustaining patients until tracheotomy could be performed or intubation made. It may be made of tin or hard rubber with the edges which are applied to the face or body of wax[1] (9), which, by heating, will make it conform to the surface of the body (Fig. 3). This application should be exact and the fitting may be done during the progress of a case.

The tracheotomy tube which gives us the most complete control of the respiratory function compared to the intubation tube or air cup is an ordinary double tube with a fenestrum in the outer tube, to permit the patient to talk when inner tube is removed. To the tracheal end of the tube rings of different sizes are adapted to prevent escape of the air and thus more thoroughly control the respiratory work. In long continued cases tracheotomy is still advocated, but not until the air cup and intubation tube have been utilized. One difficulty is that it is impossible to determine the length of time a case may take.

The intubation tube may be the O'Dwyer (Fig. 16) form of brass tubing, bent on a radius of four centimeters, with an O'Dwyer conical tip screwed to the tracheal end.

I have devised an intubation tube (Fig. 17) which consists of a rubber tube loosely fitting into brass tubing bent as above. At the tracheal end of the rubber tube a conical tip of a size to loosely fit the trachea is securely fastened, so that when the tip has been passed into the larynx by aid of the curved brass tube, the rubber tube may be advanced with its tip into the trachea a greater or less distance. With the tip in the trachea, there may be less irritation than in the larynx as with the O'Dwyer tube, and the small rubber and brass tube in the larynx is less apt to injure the vocal chords and cause irritation.

[1] The use of dental wax for this purpose was first suggested by the ate Amos C. McAlpin, D. D. S., of Warren, Pa.

FORCED NEGATIVE RESPIRATION

As stated previously, the Sauerbruch negative cabinet method, from its design, produces auto-respiration. Modifications of the auto-respiratory range of the lungs may be produced by increasing or decreasing the negative pressure. When for instance it is desired to close the pleural cavity, the negative pressure is increased sufficiently to produce such an expansion of the lung as may be needed before final closure of the wound takes place.

We are depending principally on the auto-respirations in all this work. In a condition of the patient bordering on "*extremis*" auto-respiration may be greatly impaired or entirely inhibited. In paralysis, for instance, of the respiratory centers, auto-respiration cannot ensue, and in such a case a negative cabinet would be useless, unless that within the rhythm of normal respiration, the pressure could be suddenly changed from the highest negative pressure, 7 to 10 mm. Hg., needed, producing inspiration, to atmospheric pressure, producing expiration, and kept up rhythmically.

This does not seem to be practical in a large negative cabinet and, so far as my reading goes, has not been discussed, so that it is not necessary to enlarge upon it. However, from this line of reasoning and with this little improvised negative cabinet we have added, I hope, another to the valuable features of our present respiratory progress.

With this experimental cabinet (Fig. 15) and artificial lungs, simulating the thorax with an open wound and collapsed lung, the electric blower was started. The intake of the blower was attached by a rubber tube to the outlet of the now negative cabinet, and at once the lungs previously collapsed, were inflated. By dis-

connecting the rubber tubing producing atmospheric pressure, the lungs immediately collapsed.

The air valve (Fig. 2) was at once applied but in a reversed position to its use for positive respiration, so that the air passed from the negative cabinet, or opening in the thoracic wall, which for illustration, we may wish to term it, to the intake of the blower through the valve.

The moment the piston of valve was pressed down, the collapsed lung filled up; releasing the piston produced the expiration, and with the one-two-three time rhythm, there was being produced a regular, uniform, *forced negative respiration* as perfect in all its features as forced or positive respiration could possibly be.

We have here the conditions simulating the injury. The wound in the thorax is represented by the opening in the spout of the glass funnel. In an actual case we would simply use our air cup, preferably of glass, to make the air tight connection with the thoracic cavity, and proceed with our *forcible negative respirations* (Fig. 15).

This is necessarily an emergency appliance which would frequently be useful in punctured wounds of the chest walls, with collapsed lungs and a pneumothorax, and frequently until the positive pressure or negative cabinet could be brought into use. What makes it more problematically useful is that the simple reversing of the positive pressure apparatus that is shown you to-night provides the forced negative pressure appliance.

NOTE.— Dr. Fell gave demonstrations illustrating all the points of his paper. His rubber lungs, double bellows, and blower, run for both positive and negative pressure by electric motor, were utilized.

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FRACTURES OF PATHOLOGICAL BONES (OSTEOPSATHYROSIS) AND THEIR TREATMENT[1]

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WITH the addition of the X-ray as an aid the diagnosis and treatment of fractures of normal bones have reached the state of perfection of an exact science. There is, however, a large field in the pathology of bone injuries and their repair which still requires a great deal of study; viz., the group of abnormal bone structures.

The bone develops upon the base of cartilage or fibrous tissue in such a manner that from certain points of ossification lime salts are deposited in and between the cells. These lime salts are massed more closely on the outer contours than on the inside of bones, and are arranged according to laws of mechanics and architecture, so as to render the bone a very firm and at the same time a light structure.

There is a constant change consisting of the absorption of lime salts and new deposits from infancy to old age. The carriers of these changes are large cells, myeloplaxes, or osteoclasts.

According to the researches of Metchnikoff and his assistant, Weinberg, the cells develop an acid and carry off the lime substances dissolved in the same, and either excrete them or deposit them in other tissues. This seems to be clear through the changes produced in the bones of old people. The bony structures lose much of their hardness (senile atrophy). During this period of life lime salts are found in cartilages of the joints and spinal column, also in the walls of the blood-vessels (arteriosclerosis).

Under normal conditions this loss of substance is brought about through the so-called lacunar arrosion, the osteoclasts forming lacunæ (Howship) in the bony trabeculæ.

Under pathologic conditions, for different reasons, the absorption is produced irregularly; either the lime salts are withdrawn all along the borders of the trabeculæ, forming what is called the osteomalacic hem (osteomalacia), or replacing the bony structure by other tissue or by softening and liquefaction (Schmaus).

There are conditions of pathologic nature in which the relative amount of one or the other element prevails. We find, for instance, bones in which the lime salts are extraordinarily developed, such bones being unusually hard and ivory-like (osteosclerosis).

On the other hand, we find the other extreme, in which the lime salts are missing to a certain extent, making the bones very soft. There are many varieties of this absence of lime salts with combinations of different changes in the remaining structures, from which a number of distinctly typical diseases originate. There is, for instance, the disease of rickets, a disease of infancy caused by lack of lime salts, particularly in the neighborhood of the joints, and hypertrophy of osteoclasts and vessels. There is the osteomalacia with lack of lime salts with enormous numbers of osteoclasts.

The lack of lime salts may be due to infection, such as tuberculosis and paralysis of the nerves.

In other instances the lime salts disappear with the formation of cavities which are either lined with epithelium or not, and filled with a hæmorrhagic fluid, the so-called bone cysts.

There is still another form of cavity formation in bone through the softening of tumors with absorption of lime salts.

All of these varieties and their subdivisions form more or less typical diseases. While the bone of a healthy individual can withstand a certain force without breaking, these abnormally constructed bones are easily broken. This quality has been called by the barbaric name of osteopsathyrosis (*ὄστεον ψάθυρος*) which means fragility. This is not a disease but is a symptom.

The fragility of bones depends upon many factors. It is well known that the same forces

[1] Read before the Chicago Medical Society.

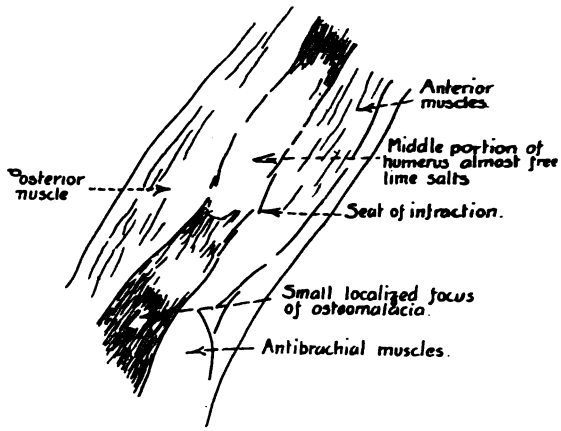
Fig. 1. Left humerus, the middle portion before treatment.

which produce a break of bone in one individual will, oftentimes, not have the same effect in another; that age, sex, health and disease play an important role in the etiology of fractures.

A child escapes an injury of a bone because of the elasticity of the bone structures, while an old decrepit individual sustains a fracture.

Still more important is the pathologic condition of bones in this respect. The literature of recent years and of older observations has a number of instances to relate of so-called pathologic fractures, in which a slight trauma, often a turn in bed, caused the breaking of a long bone, and in such cases the examination proved an abnormal state of the bony structures as, for instance, a sarcoma or carcinoma of bone, or of other rarefying conditions.

No method of examination has helped us more in this respect than the study of the



bony structures with the X-rays, which, at a glance, show us the condition of same.

We have passed the stage of being obliged to depend upon theories. We can now demonstrate these changes ad oculos. When we pass before our eyes a large number of skiagraphs of the same region of the body, obtained from different individuals, and examine them as to the density, we immediately notice a great variety. The cancellous trabecular structure, as well as the eburneous, differ greatly in different individuals and this certainly has some bearing on the fragility.

We have observed, for instance, that the bones of tuberculous and syphilitic individuals are different from those of healthy individuals, and even the same individual shows a difference in a time of sickness and health.

These differences and changes become more interesting when we come across some of the bone diseases in which these apparent inequalities of salt deposits are so pronounced as to form the most characteristic feature of the skiagram. I mean the condition of cystic degeneration of the bones.

I am positive that a number of so-called bone cysts in long bones are simply due to lacunar absorption and have erroneously been called bone cysts. Nevertheless, there are also real bone cysts. When first glancing at the skiagram the bones appear different in that the lines of shadow and light are distorted, irregular, and that the shadows of bones are more or less effaced. It is natural that such

bones must have lost a great deal of their resistance and that they are more fragile on that account. In such instances the bones may break at a slight provocation, by a simple fall. It may even be that the fall is the result of the break of the bone in such a way that suddenly the weight of the body kinks the softened and rarefied bone, causing the individual to lose balance and fall. That which is considered the cause of the fracture is, in reality, the effect of it, namely, the fall.

In some instances these changes concern only a limited portion of the skeleton, while in others they are universal throughout the bony system.

During a period of years we have observed a number of cases of this kind, but only in the last few years have we found the cause for some of them, and this knowledge was obtained principally through thorough examination of the bones by the X-rays.

Without wishing to write exhaustively on the subject of repair of these abnormal bone conditions I will endeavor to describe a few of them which we had an opportunity to study carefully, particularly as to some new ways of treatment.

OSTEOMALACIA

Osteomalacia is a disease well known in some countries and studied exhaustively but not yet fully understood. The essential osteomalacia is a well characterized disease, beginning with pains in different bones but particularly in the pelvis, and a gradual softening of the bones of the skeleton, so that the bones infract and bend, ultimately causing the body to become a distorted unwieldy mass of flesh and softened bones. It is principally a disease of pregnancy, but is also found outside of pregnancy, in men and even in children (Latzko and Preindelsberger). Fischer of Prag reports a whole family afflicted with osteomalacia. It also occurs in animals (Bonley). It is first mentioned by Grehovius. Buisson could report three cases in 1831. Trousseau called it the rickets of the adult, but Rindfleisch established it as a clinical entity.

Pathologically the changes are principally in the bones. The eburneous portion of the bones becomes porous and looks as if it had been eaten away by an acid (Saulnay). The

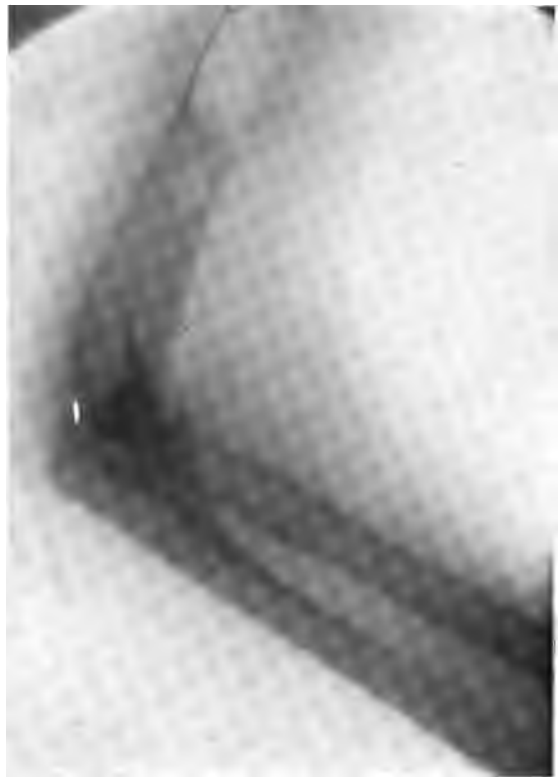


Fig. 2. Left elbow.

bone has a grayish color (Stransky) with a bloody or grayish fluid dripping from the pores. The trabeculæ of the marrow are either gone wholly, or are very much thinned and surrounded by a hem of transparent tissue, and soft, so that the bone can be cut like a cartilage with a knife. Howship's lacunæ and Haversian canals enlarge, and the marrow is congested. Aside from these changes microscopical examination reveals a large number of embryonal cells including a large amount of fat. Chemically 60 per cent of fat is found in the marrow against 24 per cent of normal (Marchand).

Many theories have been advanced as to the cause. First of all the chemical theory taught that a superabundance of lactic acid (Marchand) or phosphoric (Renard) is the cause. Rindfleisch thought that passive hyperæmia through the carbonic acid is the cause, while others declare it due to toxines. Particularly Zuern blamed a certain micrococcus,

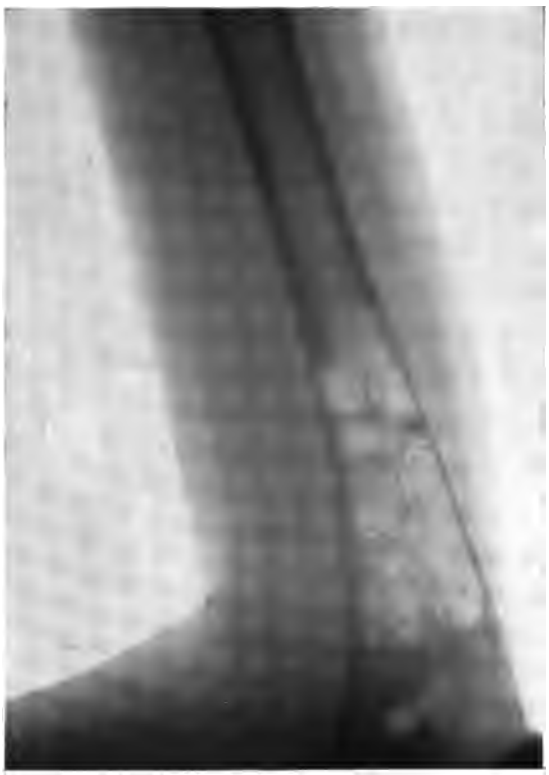


Fig. 3. Right humerus near elbow joint; the whole lower third of bone osteomalacic.

Fig. 4. Right humerus, side view; lower third osteomalacic.

which he cultivated from the bone marrow, but other authors could not find it. An interesting and somewhat convincing theory was advanced by Petrone, an Italian author, who produced such conditions by intravenous inoculation of nitrous earths. He blamed a nitrous ferment as the cause.

The utero-ovarian theory, brought forth by Fehling, is based upon empiricism. Knowing that after removal of ovaries the condition sometimes disappears, the trophoneurotic influence of the ovaries was thought to be the cause, after Virchow, and before him Ogle in England (1871), had blamed the nerves for these changes. Unfortunately for this theory, the ovaries, after removal, were found to be normal.

To me the theory of Bossi seems the most probable that the suprarenal capsules have an influence upon the regulation of the salt deposits in bones, and that the absence of the particular secretion is responsible for the riot of the cells carrying on the absorption of lime salts. It seems to be borne out by experiments as well as by the good results obtained by Bossi and others, and also by myself, by the use of adrenalin.

Bossi, who lives in a country where osteomalacia is comparatively frequent, found that an injection of adrenalin removed not only the pain, but gradually cured some of his cases. He therefore undertook some experiments on sheep. He removed the suprarenal capsule and the result was as he expected it to be. It was followed by changes almost identical clinically and pathologically with osteomalacia and thus established the connection between growth of bones and the suprarenal capsules. Other surgeons followed his suggestion and had the same experience.

In our country osteomalacia is very rare. I have seen only two case of this disease in my practice, both coming to my notice within a recent period.

While connected with Professor Schauta's clinic in Prague I had opportunity to see two cases of osteomalacia in pregnant women, both having an oöphorectomy for the purpose of cure. They both improved after the operation as far as we could judge in those days by clinical observation. All we could say was that the pain and tenderness of the bones disappeared and that the patients could again be about. In the present day we have much better means for determining the cause and effect. We can observe the changes directly with our eyes.

One of the cases which came under my observation only within the last few weeks is the case of a woman of 65 years, who had been well until a few months ago when she began to have a great deal of pain in her spine and was unable to walk. The pains were located in the neighborhood of the third and fourth lumbar vertebræ, irradiating towards the front. At the same time the woman seems to be growing smaller rapidly. The upper part of her body falls into the pelvis and she walks with great difficulty, falling, so to speak, from one side to the other. The spine in the region mentioned above is very tender. There are some symptoms of irritation of the bladder, due to some pressure upon the spine.

The X-ray picture of this case shows a certain change in that anatomical region which has been described by Neugebauer, and which is due to a softening of the tissues, particularly the cartilages, and a slipping of the same, called spondylolisthesis, but the underlying pathologic condition of this case is osteomalacia as is clearly shown by the radiograph. Under the hypodermic injection of adrenalin the case is improving.

More characteristic and important on account of its relation to fracture is the second case, which we have now observed for months and which I have the pleasure to demonstrate here to-night.

Miss S., now about twenty years of age, gives the following history. She was a robust infant until she began to cut teeth, when she had two spasms in one day. She had the usual children's diseases, such as mumps, measles, whooping cough, chicken pox, and when about twelve years old had some enlargement of the thyroid. This disappeared when she began to menstruate at the age of thirteen to a certain degree,

Fig. 5. Left humerus after treatment; new deposit of lime salts in bone clearly visible when compared with Fig. 1.

but not altogether. About one year previous to an accident to which she attributes all her trouble an oak locker fell upon her left hip which caused her to limp for some time, but she had recovered fully, when she had her fall upon her left hip and broke her left femur.

Mr. S., her brother, called on me one day in November, 1908, and told me a sad story about his young sister, a girl of nineteen years who had had a fall about a year previous, sustaining a fracture of the femur and had been bedridden ever since. The doctors who had charge of the case had done everything possible under the circumstances, but since the patient did not get well, concluded that the leg was the seat of tuberculosis, and would have to be operated upon or amputated to enable her to regain her health. He brought me two X-ray pictures which showed the condition of the femur, viz., a very angular, fibrous union of the two fragments.

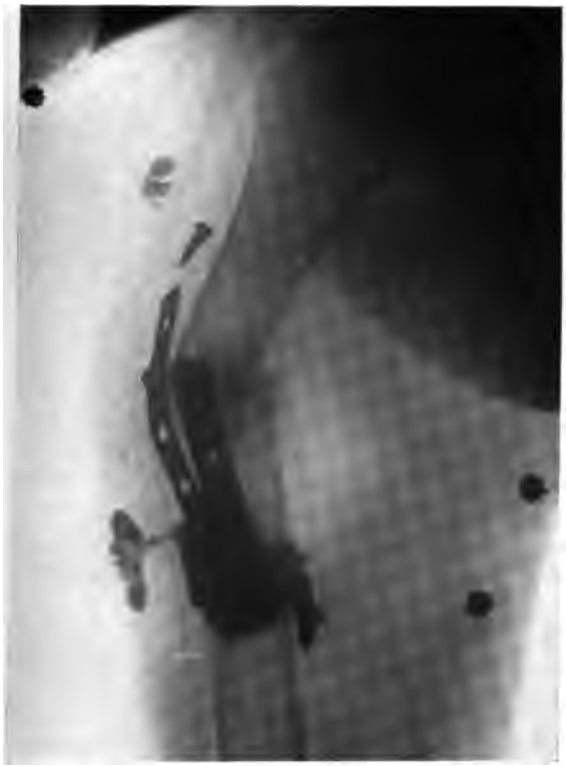
The patient was brought to the hospital and I noted the following status: A frail skeleton, rather undersized, left leg about four inches shorter, very painful and swollen, the knee stiff and swollen. An angular pseudoarthrosis or fibrous union of a fractured femur in the upper third, the usual position of the fragments, the upper one drawn outward and the lower one inward by the traction of the respective muscle groups. Above the popliteal region was a very painful indurated transverse scar from a slough produced by a plaster cast, which had cut in and caused a septic infection which

Fig. 6. Right hip joint, osteomalacic region in upper part of femur.

Fig. 7. Left femur, fractured and dislocated before treatment.

had almost carried off the patient. The foot was in a pes varus position, the large toe very painful from constant injuries during movements. The patient could move her leg only with great pain by the aid of her hands placed on hip-joint, which was free.

Our X-ray picture did not reveal to me, at first, the true nature of the bone lesion, and from the findings it was evident that nothing else but an operative procedure (an opening of the leg on the site of the fracture and an apposition of the fragments with splints, according to Lane's method) would be the best. I incised the femur over the seat of the fracture, and after adaptation of the freshened fragments I joined them by the application of two aluminum splints which were screwed on with six screws in perfect condition. An extension was superfluous. During the operation I had noticed the abnormal condition of the bony structure. The eburneous portion of the bone was very thin, the cancellous tissue very soft, so that the screws would not hold well in the soft structure. Nevertheless, the result seemed gratifying, according to a picture taken several weeks subsequently. The splints seemed to be doing their duty. The patient developed an abscess over the site of the wound, however. I took a number of pictures of the skeleton at this time and to my surprise I found the true pathologic nature, namely, the absence of bony structure throughout the whole skeleton, in spots more or less irregular, most pronounced in the long bones of the extremities. A portable extension apparatus was now fitted and by careful nursing and training we finally succeeded in enabling the patient to walk about the house with the aid of cane and crutch, whereupon she left the hospital for her home. A few months later her brother telephoned to me that his sister, while attempting to rise from a chair, had fallen and this time had broken her right healthy leg and her left arm. The doctor who was called gave a very bad prognosis. She could not move in bed without having the most excruciating pain in her arms and legs. I began to scan the literature and here the work by Bossi came to my notice, which treated of the study of osteomalacia. I had the young girl brought back to the hospital. She was in a very pitiable condition. Her left arm was so soft that I believe, had I anæsthetized her, I could have bent her humerus upon itself, so soft it seemed. The pictures show a total absence of the eburneous portion of this part, and only a faint, irregular shadow indicates where



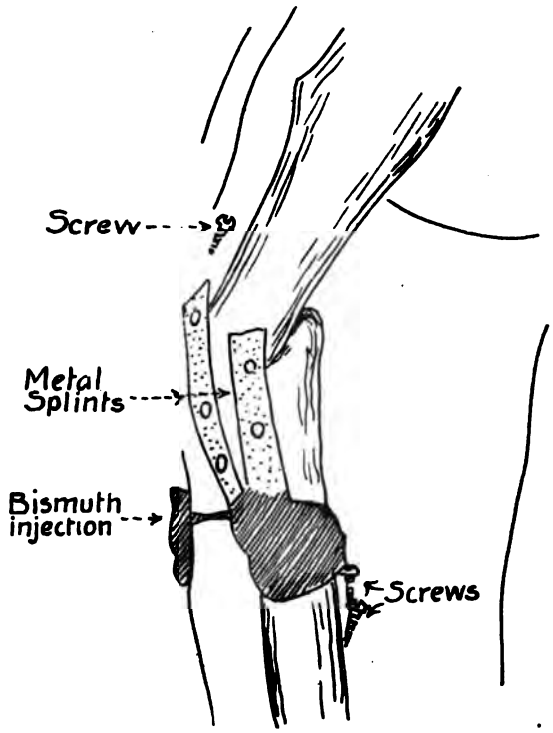


Fig. 8. Left femur after operation and treatment.

the bony structure was. The physical examination shows nothing abnormal. Urine and blood show nothing pathognomonic. I immediately began treatment with injections of ten drops of 1-1000 adrenalin. After the first injection the pain in her right limb ceased, and after the third injection (injections of twelve drops daily being made hereafter) the arm became tolerably painless and became stronger and stronger. After about a dozen injections the arm could be moved about as previous to the accident. I never was so struck by the efficiency of a drug as at this time. Altogether she received twenty-five injections. True, at times the injections caused very unpleasant symptoms, such as tremor, a rapid heart beat, but the condition was never alarming. After a number of weeks the patient left the hospital wearing a high shoe and is able to walk without a cane, and as you see here, also able to stand.

SUMMARY OF THE CASE

We have to deal here with a case of a young girl with a gradual softening of bones, due to absorption of lime salts, in areas of different size, some of them extending quite a distance, with a great tendency to fractures, with very little disposition to healing. The condition grows gradually worse until the largest portion of the skeleton, principally the long bones, are affected. With the injection of adrenalin the pathologic condition gradually shows clearly an increase of lime salts and gradual healing.

OSTITIS FIBROSA

In the Festschrift to the seventy-first birthday of Rudolph Virchow, Dr. Recklinghausen described a condition which he called ostitis fibrosa deformans. This pathologic condition of bones was characterized by the appearance of many whitish or brownish red, small tumors and cysts of the bones, with gradual deformation and distortion due to fractures and dislocation in the whole skeleton. Histologically he noticed the transformation of the bone marrow into fibrous tissue, hence the name ostitis fibrosa. Very often this fibrous tissue appeared with giant cells like a sarcoma. There have been a number of these cases of this rare disease reported (by Hirschberg, Schoenberger, and Rehn), since Rehn had a case on which he operated repeatedly. Weigert found giant cells in the tissue and consequently diagnosed the case as sarcoma. Rehn, however, regarded the case as one of ostitis fibrosa, that means an inflammatory change, with transformation of bone marrow

into fibrous tissue. Virchow and most of the observers have followed the theory regarding this condition as an inflammatory change. Pfeiffer describes in the Beiträge zur Klin. Chir., 1907, four cases of this comparatively rare condition, and states that it remains for a long time unobserved until some fracture or deformity following a fracture brings the case to the observation of the surgeon. Out of forty-nine cases recorded there have been twenty spontaneous pathologic fractures reported. From this disease must be differentiated a condition described by Ollier and his pupil Poncet, called ostitis and periostitis albuminosa; similar inflammatory changes are found due to staphylococci or tubercle bacilli (Sleelswijk and Vollert).

BONE CYSTS

For a long time cases have been reported as bone cysts and cystic degeneration of bone which pathologically were really different conditions. We ought not to use the term "cysts" as long as we know the true pathologic origin of a condition, but it is one of those inherited terms which will make their appearance in the literature as long as there is no better understanding of their origin. Cyst means an accumulation of liquid or semiliquid substances within a shell or wall, but since it often happens that pathologic conditions of different nature, inflammatory and tumors, undergo changes of regressive nature leading to liquefaction we often have to deal with accumulations of liquids or semiliquids in shells or walls belonging to the class of tumors or inflammation. The true cyst is one in which the wall is lined with an epithelium which secretes the fluid. Such cysts are common in the ovaries, but they are very rare in bones, in fact I do not know of any authentic case of such kind, except the bone cysts of the jaws and parasites. There have been different conditions observed in bones which have been called cysts, among other the following: 1. Ziegler describes small cystic formations under the cartilages of arthritis deformans. 2. Rindfleisch, C. C. Schmidt, and Mommsen have described cysts in osteomalacia. (Those are the same kind as in our case two of osteomalacia described above.) 3. Lubarsch describes small cysts in old individuals, particularly in the neighborhood of the hip-joint as of common occurrence. 4. The dental cysts; these are the only ones which are lined with an epithelium. 5. All degenerations of tumors and inflammations. 6. Parasites (echinococcus).

Of the variety of cystic formations of bones I have had one case which I have the chance to present to you to-night.

The history is as follows: I. H., was five years old when she was brought to me by her uncle, a physician, during the meeting of the American Medical Association, in Chicago, June, 1908. She had sustained a fracture of the hip by a fall, as I was told. She was seen by one of our foremost orthopedic surgeons who had a picture taken which revealed a very peculiar feature thought to be a tumor of the hip, perhaps a sarcoma, and the surgeon referred her to me for operation. The picture of the case showed an excellent skiagraph of a typical bone cyst, the trochanter major was considerably larger on the injured side and seemed to be deprived of its lime salts, leading to formation of small cavities, something like a honeycomb. An incision made over the trochanter and the knife entered easily into the softened bone structure which seemed to be transformed into several chambers filled with a reddish brown hæmorrhagic mass. This mass was evacuated and the part of the shell which seemed to be superflous was excised. It seemed as if there was only a small bridge of bone connecting the head of the femur with the shaft. A strip of gauze was introduced and the wound sutured. The child made an uneventful recovery, and was able to go home in about two weeks with a cast on her limb. A few months later she was on her feet and very soon learned to walk. X-ray pictures were taken at regular intervals and to-day it shows that the region has regenerated bone well enough to make a strong head to walk upon, though the angle of the head and neck and shaft of the femur approaches more and more the right angle and there is a shortening of about an inch and one-half. The child limps slightly but she has no difficulty in walking. The microscopic examination of the structure removed, showed a loss of lime salts together with large embryonal cells taking the place of bone cells, with a good deal of hæmorrhagic infiltration. No trace of a malignant growth could be found.

SUMMARY

We have to deal here with a case of cystic degeneration of the bone, or what is called bone cyst. The term does not fit exactly the pathologic condition, but we do not know enough about these conditions to classify them exactly and it will require a great deal of time and study to place these cases right.

I have in my possession a number of skiagraphs of conditions which are similar in many

respects to either one of these cases,— in other respects widely different, and I take an occasion to demonstrate a number of skiagraphs to show the changes without being able to explain the true nature of these pathologic conditions. They all have one symptom in common, however, the bones are very fragile, and consequently I place them under the term osteopsathyrosis, which means, however, nothing else but fragility.

THE INCREASE OF CANCER[1]

By WILLIAM B. COLEY, M. D., New York City, New York
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IT is a remarkable fact that a disease so widely prevalent as cancer and one that has from time immemorial held first place in the amount of suffering that it inflicts upon its victims, and is now approaching front rank in the number of those victims, should have received such meager attention from both local and national boards of health. Antituberculosis leagues have become universal, government boards of health and scientific medical bodies all over the world have long since instituted a well-organized campaign against the white plague, with results that even now justify the hope of speedy control with the possibility of ultimate conquest. While much has been written upon the question of the increase of cancer, many of the papers have been attempts to explain away the figures of the vital statistics, which in every civilized land during the last half century have shown a steady increase in the number of deaths from cancer.

The purpose of the present paper is to go over the evidence at present at our command, in the hope of arriving at some conclusion as to whether cancer is increasing or not.

Roger Williams in his recent book on the *Natural History of Cancer*, states that the disease has doubled in frequency in periods ranging from twenty to thirty years, the annual increase averaging from 3 to 5 per cent.

Williams refers to the unique statistical study of cancer made by Ekblom (*Hygeia*, January, 1902,) for the small Swedish town of Fellingsbro. Taking the average for the first and last decennial periods of the century, he showed that the cancer death rate increased from 2.1 per 100,000 living in the former period, to 118 living in the latter.

The only statistics in Great Britain which compare with these statistics as regards the period of observation, are those of the Scottish Widows' Life Insurance Fund (Edinburgh, 1902). The records of this Fund show the proportion of deaths due to cancer to the total mortality among males since 1815:

	Per cent
1815 to 1844	0.93
1845 to 1858	1.79
1859 to 1866	3.00
1867 to 1873	4.56
1874 to 1880	4.93
1881 to 1887	5.44
1888 to 1894	6.88

The records of the German Life Insurance Company strikingly confirm the foregoing figures. The cancer mortality among males from 1885 to 1889 amounted to 3.7 per cent of the total deaths, and among females to 11.4 per cent; from 1889 to 1895, however, the ratio was 11.4 for men and 12.9 for women.

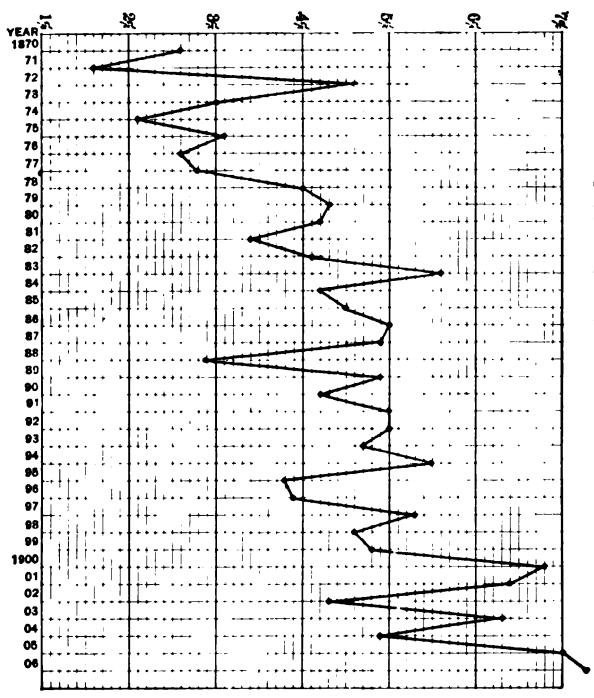
PERCENTUM RATIO OF DEATHS FROM CANCER TO TOTAL DEATHS. EXPERIENCE OF ÆTNA LIFE INSURANCE COMPANY OF HARTFORD, FROM 1870 TO 1906

(For which I am greatly indebted to Dr. E. I. McKnight and Dr. E. A. Wells, of Hartford, Conn.).

Year	Total Deaths	Deaths from Cancer	Per cent
1870	426	11	2.6
1871	432	7	1.6
1872	486	8	4.6
1873	579	18	3.1
1874	474	10	2.1
1875	527	16	3.0
1876	536	14	2.6

[1] Read by title before the Southern Surgical and Gynecological Association, December 14, 1909.

Year	Total Deaths	Deaths from Cancer	Per cent
1877	544	15	2.8
1878	502	20	4.0
1879	532	23	4.3
1880	542	23	4.2
1881	593	20	3.4
1882	565	23	4.1
1883	656	37	5.6
1884	645	27	4.2
1885	667	30	4.5
1886	715	36	5.0
1887	719	34	4.9
1888	783	23	2.9
1889	761	37	4.9
1890	817	34	4.2
1891	897	45	5.0
1892	1019	51	5.0
1893	1013	48	4.7
1894	956	53	5.5
1895	1052	40	3.8
1896	1029	40	3.9
1897	1044	55	5.3
1898	1051	48	4.6
1899	1114	54	4.8
1900	1215	83	6.8
1901	1303	84	6.4
1902	1267	55	4.3
1903	1386	87	6.3
1904	1432	70	4.9
1905	1388	97	7.0
1906	1514	111	7.3



In England and Wales the later statistics have separated the rural population from the urban. The cancer rate in the rural districts seems to have suffered much less than in the urban. Considerable difficulty, however, results from the fact that a number of rural cases of cancer go to the city for operation, thus adding to the mortality of the urban population by at least the number of such cancer patients as die from operation. It is probable that the majority of patients who come to the city for operation and recover return to their respective homes, where they remain until death.

During the last six years, in England and Wales, 176,019 persons died of cancer. Of these, 104,418 were females and 71,601 males. Of 10,000 males dying of cancer, 2,172 had cancer of the stomach; of 10,000 females, 2,250 had cancer of the uterus. Of the males who died of cancer in this period, 43,092 died of cancer of the intestinal tract; stomach, 15,553; intestine, 5,439; rectum, 7,277; œsophagus, 4,505; liver and gall-bladder, 9,328.

London, per 100,000: 1851 to 1860, 42; 1861 to 1870, 48; 1871 to 1880, 55; 1881 to 1890. 68; 1891 to 1900, 85; 1901 to 1904, 92.

Berlin, cancer and tumors: 1881 to 1885, 55; 1886 to 1890, 65; 1891 to 1895, 75; 1896 to 1900, 85.

French statistics show that the increase has been general, and not an increase of obscure internal or abdominal cases that could be accounted for by increased accuracy in diagnosis.

France, Denmark, Sweden, and Bulgaria. causes of death tabulated for towns only.

AVERAGE FOR TEN YEARS, 1896 TO 1905 PER 1000 LIVING

Switzerland	1.29
Netherlands	0.95
Norway	0.90
England, Wales	0.83
Scotland	0.81
German Empire	0.74
Victoria	0.72
Austria	0.70
New Zealand	0.63
Ireland	0.63
South Australia	0.61
Prussia	0.61
New South Wales	0.59
Tasmania	0.50

Italy	0.53
Queensland	0.50
Japan (average five years)	0.49
Spain (average six years)	0.44
Western Australia	0.38
Hungary (average seven years)	0.35
Servia	0.09
Ceylon	0.06

CANCER DEATH RATES

Among the places showing the lowest death rate from cancer in the State of New York are. Hudson, 36.8 per 100,000; Little Falls, 175: per 100,000; Ithaca, 156 per 100,000; Johnstown, 115 per 100,000.

In New York City in 1908 the rate was 75.4 per 100,000.

The difference in the different boroughs of New York is noteworthy:

In the borough of the Bronx the rate is highest, being 95.8; it is lowest in Queens, namely, 68 per 100,000.

The mortality of the white and colored population, under the same conditions, in New York City is practically the same, viz., 75.4 white; and 71.8 colored.

The death rate of the colored population shows most extraordinary differences in the different boroughs: In Manhattan borough it is 57.5 per 100,000; in Bronx, 244; in Richmond, 150.

It is very difficult to explain these differences, especially as the general cancer death rate throughout the South is distinctly lower in the colored race than in the white. It is also lower in New York City in general.

The marked, constant, and general increase in the death rate from malignant growths in the twenty-eight principal cities of the United States from 1883 to 1907 is clearly shown in a paper by Roy F. Edwards.[1] These 28 cities, in 1883, with a total population of 6,097,585, showed 2,960 deaths, or a rate of 48.5 per 100,000 living. In 1895 the population of these cities was 9,157,682, with 5,377 deaths from cancer, or a rate of 58.7 per 100,000 population. In 1907, with a population of 12,524,695, there were 9,686 deaths from cancer, or a rate of 77.3 per 100,000. Thus, in a period of twenty-four years the death rate increased from 48.5 to 77.3 per 100,000.

These figures were taken entirely from local bureaus of vital statistics. Actually, the death rate from cancer is far greater than the rate shown by the vital statistics, for the reason that there is prevalent among the laity a strong prejudice against the name cancer, the result being that in many cases of death from cancer, especially metastatic cancer with internal complications, the family physician, out of respect for this feeling on the part of the family, will assign some of the secondary causes in place of the actual primary cause of malignant disease.

The great extent to which this is true has recently been shown by Gulliot, of Reims, France, who made a careful comparative study of the number of cases certified to have died of cancer, and the actual number known to have died of cancer in a given locality in a given period of years, and found that the number who had actually died of cancer was exactly double the number certified to have so died.

AMERICAN AVERAGE PER 100,000 POPULATION

Cancer.	1900-'04.	1901.	1902.	1903.	1904.	1905.	1906.	1907.
Registration area	66.5	64.5	68.3	68.6	70.6	72.1		
Boston	89.6	88.2	87.5	93.2	95.7	105.6	100.1	104.6
Massachusetts	83.0	82.0	86.7	85.0	86.3	92.9	90.3	93.5
San Francisco	124.0	115.2	128.3	125.3	134.3	125.0		
Indiana	47.0	44.0	47.0	49.0	50.0	55.0	53.7	57.1
Vermont	81.0	70.0	69.0	93.7	87.0	84.2	85.3	99.0
New York City	68.5	69.0	66.0	69.5	71.4	72.0	74.0	76.8
New Haven	...	...	...	79.4	71.9	92.4	83.3	100.5
Providence, R. I.	...	...	...	80.8	96.9	97.2	93.5	108.7

Registration area, 1900	36,846,981
Registration area, 1907	41,758,037
Estimated population, 1907	85,532,761

LOWEST RATES OF CITIES IN THE UNITED STATES

Louisville, Ky.	50.1
Paterson, N. J.	56.1
Detroit, Mich.	65.0

HIGHEST CITIES

San Francisco	125.0
Boston	104.0
Providence	108.7
Lowest rates, Indiana, average 1901 to 1905	49.5
Highest rates Maine, average 1901 to 1905	86.7

Deaths from cancer registration area in the United States for 1907 were 30,514, or 1,494 more than in 1906, and a rate of 73.1 in 1907, compared with 70.8 in 1906. Estimated deaths from cancer in the United States for 1907 were 63,508.

[1] Medical Record, December 18, 1909.

"The crude death rates from cancer continue to increase, and slightly higher rates are recorded for each main subdivision of the registration area. For the year 1908, 33,465 deaths from this disease were returned, and the death rate was 74.3 per 100,000 of population, as compared with 30,514 deaths and a death rate of 73.1 for 1907."[1]

Schuster,[2] in his statistical study of carcinoma, shows the death rate from cancer between 1863 and 1867 to have been 7.14 per 10,000; from 1873 to 1877, 10.39; from 1893 to 1897, 12.21; from 1903 to 1907, 14.76.

According to *K. Sato*,[3] of 64,030 patients treated in Japanese hospitals, 1,372, or 2.14 per cent, suffered from cancer. The proportions in which the various organs were affected are as follows: Uterus, 33.53; stomach, 32; intestines, 6.2; breast, 5.69; skin, 2.17; œsophagus, 1.53 per cent.

Various attempts have been made from time to time, particularly by Newsholme and his followers, to question the reality of the increase of cancer. Some have declared it due simply to the increase of population, but, as Williams has pointed out, while the population of Great Britain doubled between 1850 to 1905, the cancer mortality increased six times.

Another explanation of the increase of cancer which has been more widely accepted is, that during recent years, due to improved hygienic conditions, a larger number of people have reached mature life, or the cancer age, and for this reason a larger number would be affected by cancer. Williams' reply to this is that the saving of life in modern times has been almost entirely confined to the precancerous period, the death rates of males over thirty-five years and of females over forty-five years having remained almost stationary, while the proportion attaining old age has decreased.

The objection so strongly urged by Newsholme is that the increase of the cancer death rate is due chiefly to improved methods in diagnosis.

This objection was answered many years ago by Mitchell Banks, one of the most careful students of cancer in Great Britain, and a man of wide experience. Banks stated that while the diagnosis of cancer in its early stages is probably made much more frequently now than in former times, it required little skill to make the diagnosis at the time of the death of the patient. The diagnosis at such a time was by no means beyond the ability of even the rural practitioner of fifty years ago.

Williams further points out that the increase has been far too uniform and steadily progressive during this long succession of years to leave any basis for such an argument, and, taking the increase over the entire period, he believes it to be so enormous as to make the explanation seem far-fetched. While it is possible that improved methods in diagnosis may add slightly to the total cancer death rate, Williams points out that these very improvements in diagnosis may also cause subtractions from it, and he shows that in the report of the Registrar-General as late as 1880 such diseases as fibroid tumor, polypus, and lupus were usually classed as cancer. Since then these diseases, as well as a number of other conditions at one time regarded as malignant, have been assigned to other causes.

A careful study of the whole subject shows the increase to be a general one and not limited to a few parts of the body. In other words, intra-abdominal or inaccessible cancer, which would be the type most likely to be affected by improved methods of diagnosis, shows even less relative increase than external cancer. In 1868 the death rate for cancer of the stomach per 1,000,000 living, thirty-five years and upward, was 283.65 for males and 193.45 for females. In 1888 the rate had increased to 346.15 for males and 277.75 for females, making an increase of 22 per cent for males and 44 per cent for females; but in this particular period the death rate of cancer in general had increased 50 per cent.

The greater death rate of malignant disease in women is due to the large number of cases which occur in the breast and the uterus. In all other localities the liability in the male is much greater than in the female.

Cancer has already increased to such an extent that at the present date it causes more deaths among women than tuberculosis, in 1905

[1] Department of Commerce and Labor, Bureau of the Census, 1908, Bulletin No. 104.

[2] Zur Carcinom Frage, Bamberg, 1909.

[3] Gann, Results of Cancer Research in Japan, 1907.

the rate being 100 cancer deaths to 94 from tuberculosis. Even taking men and women together, and at all ages, the death rate from cancer is rapidly approaching that of tuberculosis. From 1851 to 1860 the death rate per 1,000,000 living was 317 for cancer, 2,676 for phthisis, and 807 for other tuberculous disease; while from 1891 to 1900 the rate was 754 for cancer, 1,391 for phthisis, and 619 for other tuberculous diseases.

That the death rate of cancer is often much higher among the rich and well-to-do is shown by some of the Irish statistics. In prosperous Armagh the rate was 104, while in poverty-stricken Kerry it was as low as 26.

In Switzerland we have a low tuberculosis mortality, but an exceedingly high cancer death rate; and even here the rate is steadily increasing, having risen from 114 in 1889 to 132 per 100,000 living in 1898. Here two-thirds of the people are engaged in industrial and commercial work and only one-third in agriculture.

Williams states there are no millionaires in Switzerland and no paupers; prosperity is more widely diffused than even in France.

In Denmark the mortality from cancer is 130 per 100,000 living, with a phthisis rate of 150.

In studying the statistics of France we have to consider that they are based entirely upon urban population, excluding the rural populace, thus covering only 12,000,000 out of a total of 39,000,000. The population of France has remained relatively more stationary than in most other countries of which statistics exist, and yet the death rate of cancer shows the same constant increase as elsewhere. In Paris the death rate of cancer in 1865 was 84; 1870, 91; 1880, 94; 1890, 108; 1900, 120.

The towns above 10,000 show, in 1887, 76; 1890, 91; 1895, 100; 1900, 106.

In Australia the death rate per 100,000 living has been as follows: In 1851, 14; 1861, 19; 1871, 25; 1881, 32; 1891, 45; 1901, 57.

The Australian statistics show a remarkable difference between the Australian-born and British and foreign population. Of the former, 58 in 100,000 living died of cancer, as against 137 of the British and foreign-born.

There is much difference of opinion as to the frequency of cancer in China, but there is no question that the Chinese in other parts of the world suffer severely from the disease. In 1900 the rate among Chinese in Australia was 72 in 100,000. On the other hand, among the Australian natives, i. e., the aborigines, which in 1891 numbered 60,000, cancer is very rare.

Medical men who have lived among the Pacific Islanders for many years state they have never seen a case of cancer.

In Ceylon and Java the cancer mortality is very low. This, however, may be partly explained by the fact that the death statistics are very incomplete, the causes of death in the large majority of cases not having been medically certified.

In nearly all the countries from which reliable returns have been obtained the cancer mortality has shown a general tendency to increase in recent years. On the other hand the statistics of tuberculosis show 56,841 deaths, or 6,041 less than the average for ten years.

The cancer statistics of last year show 31,668 to have died of cancer in England and Wales, being 2,882 more than the average for ten years, the male increase over the decennial average being 16 per cent, the female increase 6 per cent, making 794 deaths from cancer per 1,000,000 living males and 732 for females, both being the highest rates on record.

A careful analysis of the statistics of cancer that are obtainable at the present time forces one to the conclusion that there is a constant and considerable increase in the number of people afflicted with cancer in all civilized countries. How can we best explain this increase?

The pathologists together with the clinicians who accept Cohnheim's theory as the true explanation of the cause of cancer try to explain this increase of the cancer mortality by changes in the mode of living as compared with previous years. Many, like Roger Williams, believe that the increased consumption of nitrogenous food has much to do with the increase of cancer. Attempts have been made to show that it is more prevalent among the rich and well-to-do than among the poor and ill-fed. A careful study of the cancer statistics, however, does not fully bear out this assumption. Some

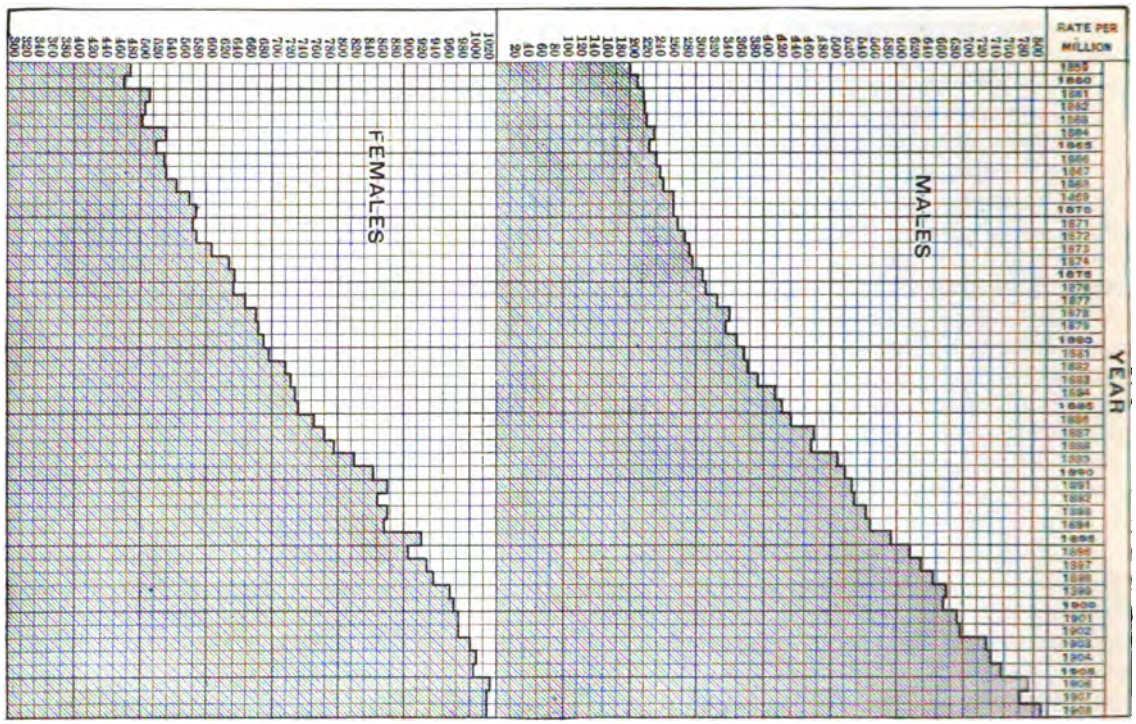


Table showing increase of cancer in England from report of Registrar General, 1908.

of the districts in which the cancer mortality is the highest are rural districts, in which the people live in a very simple manner. Some writers attribute a high cancer mortality to luxurious living, especially to large consumption of meat and alcohol. This is hardly true, as the mortality of Copenhagen, 138 per 100,000, is nearly double that of London, Paris, or New York.

My own feeling is that the most rational explanation is to assume that cancer is of extrinsic or microbic origin.

New evidence in favor of the endemic and, possibly, infectious nature of cancer, is found in a paper on "Cancer in New Zealand," by Hyslop and Fenwick.[1]

They state that although New Zealand has the lowest death rate for the world, there is, nevertheless, a persistent increase in the percentage of deaths from cancer. In the year 1898 the rate per 100,000 living was 64; in 1907 it was 73. The alimentary tract was the seat of invasion in the great majority of cases of both males and females. In males the stomach was the seat of the cancer in 32.5 per cent of the total number; intestine and rectum, 10.8 per cent; liver, 11.8 per cent. In the females: stomach, 21.9 per cent; intestine and rectum, 12 per cent; liver, 16 per cent.

One of the writers collected 31 cases of cancer which had come under his personal observation in his own district, and found that of 16 male cases, 11 occurred in the bowel.

Dr. Hyslop describes at length the topography of the district in which his cases were observed — a flat tract, lying between a snowfed river and a smaller stream. A large portion of the district is seasonally flooded by these streams, and the high mortality from cancer is in harmony with the conclusions of Haviland, based on a careful study of the geographical distribution of cancer.

It is of further interest to note that 6 of the 31 patients all lived in the same house. These 6 persons were all shepherds, agricultural laborers, or farmers, and they were not related by blood, thus entirely excluding the element of heredity.

As regards the habits of the patients, all

[1] British Medical Journal, October 23, 1909.

drank tea with their meals three times a day, and nearly all of them had meat three times a day.

The great variation in the death rate from cancer in the different parts of New Zealand is also interesting:

Dr. Britton, who at one time practiced at Ross, on the West Coast, found from his note-books and death certificates that during a practice of three years he had 35 deaths. Of these, 20 were under nine years of age; the remaining 15 between ten and seventy-eight years; in 5 of these, or 33.3 per cent, death was due to cancer. While in his ten years' practice on the East Coast his records showed 71 deaths, only 1 of which was due to cancer.

CONCLUSIONS

A great mass of evidence, based upon vital statistics, shows a well-marked and steady increase in cancer in practically every civilized country.

Attempts to explain away this increase as an apparent and not a real increase are far from convincing.

Without any further increase the present death rate from cancer is appalling.

Furthermore, the actual death rate from cancer is much higher than the known rate, by reason of the fact that in many cases of patients dying from internal metastases the strong prejudice of the relatives against the name of cancer is respected by the family physician, and some secondary cause of death appears in the certificate, instead of the primary cause, cancer.

The object in pointing out the ravages of this disease is to awaken a more profound interest on the part of the laity as well as the profession in cancer problems. Physicians can help toward the solution of this problem by making a careful study of every case of cancer that comes under their observation, recording every fact. When collected in sufficient numbers, such facts may throw some light upon the etiology of the disease and help to settle the vexed questions of heredity and contagion.

The pathologists are already deeply interested in the study of cancer, but the laboratory studies alone of cancerous tumors can never solve this great problem of the cause of cancer. The problem must be attacked from all sides — the clinical as well as the laboratory.

Once aroused to the importance of this problem the laity will lend its support by way of greatly increased endowments for cancer research work, and better and more efficient co-operation of state and national boards of health will follow.

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ON THE VALUE OF THE SHADOWGRAPH URETERIC CATHETER IN THE DIAGNOSIS OF OBSCURE LESIONS OF THE URINARY ORGANS [1]

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THE value of the shadowgraph ureteric catheter, and its permanent place in our diagnostic armamentarium is conceded by all whose work brings them in contact with cases presenting obscure lesions of the urinary tract. Not only is this method of value in cases presenting distinct lesions of the urinary tract, but it is particularly valuable in cases in which the symptoms are located on the right side of the abdomen, and therefore calling for a differential diagnosis between appendicitis and stone in the right ureter.

This method of diagnosis was first reported by Schmidt and Kolisher of Chicago in 1901. Although this method is of very recent origin, its value has been demonstrated many times over; it has been of service in making a diagnosis in many obscure cases in which the diagnosis could not have been established without it, and this applies particularly to borderland cases that could not have been cleared up with the X-ray alone or with cystoscopy and the ureteral catheter.

A few remarks on the technique may not be out of place. Before the cystoscopic end of the work is undertaken it is of course necessary for the Roentgen apparatus to be in perfect working order, and the operator ready to proceed with his exposures. It is very desirable to have the patient take a brisk cathartic the day before, so as to have the bowels well emptied before proceeding with the X-ray work. The usual preparations as for an ordinary cystoscopic examination are carried out. For catheterization I have always used an ordinary ureteral catheter armed with fuse wire. This is soft and pliable, therefore permitting the catheter to easily follow the ureter in its entire course without causing any deviations in it, as could be the case if a fine nonpliable wire were used. There is no step in the entire procedure which does not permit one to carry out the most rigid kind of asepsis. I usually sterilize the fuse wire by allowing the wire to remain in an antiseptic solution, employing for this purpose the germicidal disks of Parke, Davis & Co. These do not corrode the wire. Before inserting the wire into the catheter care should be taken to see that all of the antiseptic solution has been removed from it by wiping it dry with a sterile piece of gauze. A small amount of sterile glycerine may be used as a lubricant to aid in passing the wire into the lumen of the catheter. After the catheter has been removed at the end of the examination, the wire should be withdrawn immediately, lest it becomes firmly adherent to the inner side of the catheter, and hence rendering further sterilization of the catheter impossible.

Shadowgraph catheters may be conveniently divided into two groups:

1. In the first group may be placed catheters which owe their shadow producing qualities to the presence of bismuth subnitrate or cinnabar; these substances are usually mixed with the varnish or shellac that is used as a coating on the outside of the catheter. Cinnabar was first suggested by Goebell.

2. In the second group the shadow producing quality is due to the presence of a stylet in an ordinary ureteral catheter. Various agents have been recommended for this purpose, such as, for example, silver wire, fuse wire, or copper wire.

Lesions in the right lower quadrant of the abdomen very often give rise to obscure symptoms; this frequently necessitates making a differential diagnosis between appendicitis and stone in the ureter.

This differential diagnosis is not always very easily made especially in those cases of appendicitis accompanied by the presence of blood in the urine, and in which very fre-

[1] Read by invitation at the meeting of the Chicago Surgical Society, April 8, 1910.

quently a diagnosis of stone in the ureter is made. As an example of the difficulties arising in this class of cases I should like to mention the following case:

CASE 1. Mr. C., referred by Dr. Frank Wright, July 10, 1909. In December, 1908, the patient was seized with a severe attack of pain in the right side of the abdomen accompanied by fever and rigidity of the abdominal wall. He was free from symptoms until June 8, 1909, at which time he had another attack of pain in the abdomen accompanied by rigidity of his right side, a temperature of 99+°, vomiting and frequency of urination. This attack lasted for eight days. At the end of the second day the temperature came down to normal, *but the frequency of urination persisted.* At this time Dr. Wright found red blood cells present in three different specimens of urine that he had examined microscopically.

Just before leaving the hospital the patient had another attack of pain. During this attack he would urinate from two to three times every hour during the day, but he was never obliged to urinate at night. During urination he had pain in the urethra. The patient states that during this attack the pain started in the region of the right kidney and radiated down into the pelvis. At times the pain would radiate to the opposite side of the abdomen.

Each attack of pain, except the first, was associated with frequency of urination, and the presence of pus cells in the urine.

Physical examination. The rectal examination was negative. Head, neck, and chest were negative. A definite point of tenderness was elicited one fingerbreadth below the last rib on the right side and about four inches from the spine. A second point of tenderness on pressure was found about one fingerbreadth above McBurney's point.

This case is interesting from the standpoint of differential diagnosis and illustrates the difficulties arising in the differential diagnosis between appendicitis and stone in the ureter on the right side. There were present in this case symptoms suggesting appendicitis, namely, right sided pain, tenderness, rigidity, as well as a slight rise in temperature. The frequency of urination, pain in the urethra during urination, presence of pus in the urine and the demonstration of red blood cells in the urine were highly suggestive of stone in the ureter.

After a careful consideration of the subjective symptoms, and the tenderness above McBurney's point in front and the tenderness under the last rib behind, we decided that an X-ray picture be taken after a shadowgraph catheter had been passed up to the right kidney. Because of the extreme nervousness of the patient and of the sensitiveness of the urethra and bladder it was decided to administer a general anæsthetic. Cystoscopy was easily carried out. The bladder was normal; a catheterizing cystoscope was then introduced and the ureteral catheter passed into the right kidney without any difficulty. No obstruction to the passage of the catheter was met with. The X-ray picture was taken by Dr. Hollis E. Potter. It shows the cystoscope in the bladder. The shadowgraph catheter can be seen passing from the cystoscope toward the wall of the pelvis and upward along the usual course of the ureter. No stone shadows were found anywhere along the ureter, and a diagnosis of appendicitis was made.[1] At the operation a retrocæcal appendix was found bound down to the ureter by many adhesions. Appendectomy. The patient made an uninterrupted recovery and has been free from symptoms ever since. See Fig. 1.

CASE 2. Mr. J. M., aged 60. Referred by Dr. Wm. Hessert. Ten years ago the patient was suddenly seized with very severe pains in the right upper part of the abdomen. This attack was first diagnosed as appendicitis but was changed by the attending physician to renal colic. Following this attack he passed a flat stone, about the size of a pea, through the urethra. After this attack he enjoyed good health up to four years ago, at which time he again began to have pain in the right side of the abdomen. This attack subsided quickly under the use of hot fomentations. The patient never noticed any blood in the urine. The present attack began four days prior to admission to the hospital, with a feeling of weakness and pain in the right upper quadrant of the abdomen. The pain is of a short character and associated with a dragging sensation in the right testicle. During this attack there have been no urinary symptoms, such as painful or frequent urination, and there has been no stoppage of the stream. Neither nausea nor vomiting.

Examination of the abdomen. The abdomen is rigid. The area corresponding to the right kidney presents distinct localized tenderness. There is no tenderness over McBurney's point, nor is there any lumbar tenderness.

Urinary examination. Cloudy, straw, 1020, acid. Alb. + casts, red blood cells many.

X-ray examination. Several X-ray pictures were taken and they all showed the presence of several shadows in the pelvis; it was then decided to take another X-ray picture with a shadowgraph catheter in the ureter to determine the origin of these shadows. Cystoscopic examination of the bladder was negative. The ureteral orifices were normal. The shadowgraph catheter easily entered the orifice and was advanced

[1] X-ray pictures were also taken of both kidneys which were negative as regards the presence of stones.

without meeting any obstruction. An X-ray was now taken and shows that the shadows are of extraureteral origin, therefore excluding ureteral stone. See Fig. 2. X-ray examination of the kidneys was negative as to stone.

The really interesting feature of this case is revealed by the course of the ureter as shown by the shadowgraph catheter, which, instead of passing upward out of the pelvis and parallel to the spine upward to the kidney region, passes inward toward the median line. From here the catheter passes upward and outward and stopping above the crest of the ileum. This kink in the ureter forms almost a right angle. See Fig. 3.

In this case the shadowgraph catheter was of double value. It excluded the possibility of the shadows seen in the pelvis being caused by stones in the ureter, and secondly, by demonstrating the low position of the kidney, as well as the abnormal course of the ureter. The pathological course of the ureter and the low position of the kidney can easily be called upon to explain the patient's symptoms. The patient refused operative treatment.

In the previous case the shadowgraph catheter was of value in excluding the shadows in the pelvis as being due to ureteral stones. In the following case its value in demonstrating the shadow first seen as being of an intraureteral origin, can be appreciated by referring to Fig. 4.

This case[1] has been reported in detail by Dr. Bevan and myself a short time ago. Patient, a male, age 52, who entered the service of Dr. Bevan at the Presbyterian Hospital, December 5, 1908, states that four years ago he first noticed disturbances in micturition at which time he was unable to void urine for a long time, and at other times he would have attacks of frequency of urination. During these attacks of frequency of urination he would pass small amounts of urine. During these attacks he also complained of severe abdominal pain in the left lower quadrant of the abdomen. The pain would last for three or four hours and then pass away very suddenly. While in these attacks he would feel nauseated, but he never vomited. The patient states that when suffering these attacks his urine was turbid. For the past eleven months the patient has felt a pain or discomfort in the left lower quadrant of the abdomen and when the pain was severe it would radiate toward the kidney and bladder. Patient has not lost weight and has been able to work most of the time.

[1] From the surgical clinic of Dr. Arthur Dean Bevan, Rush Medical College, Chicago.

Physical examination. Head, neck, negative. Heart, normal borders, no abnormal tones. Lungs, negative. Abdomen: No tenderness over the bladder or kidneys. Tenderness may be elicited by firm pressure in the left lower quadrant of the abdomen. Rectal examination, negative. Blood examination, hæmoglobin 93 per cent. Leucocytes 8,350. Urinary report: color red, physical condition turbid; specific gravity 1,020; sediment, no casts found; epithelial cells, leucocytes, and red blood cells present.

Cystoscopic examination. This shows a slight amount of injection of the vessels of the trigone. Internal urethral orifice negative. On account of the location of the pain on the left side and owing to the fact that the suspicious shadow was found on the left side, it was decided to catheterize only the left ureter. For this purpose a ureteral catheter armed with fuse wire was used, and passed into the pelvis of the kidney without meeting any obstruction.

A second X-ray picture was now taken with the catheter in the ureter, by Dr. Hollis E. Potter. Upon examining the skiagram, the catheter can be seen passing along the bulbous and posterior urethra through the bladder, passing toward the lateral wall of the pelvis and upward toward the kidney region. In the pelvic portion of the ureter and lying internal to the catheter the shadow produced by the stone can be seen; these findings absolutely established the diagnosis of stone in the ureter. The stone was removed by Dr. Bevan who approached the ureter extraperitoneally using the same incision as the one used in ligating the common iliac artery. The patient made an uneventful recovery and left the hospital at the end of two weeks.

As an illustration of the value of the shadowgraph catheter in the diagnosis of Dystopic pathologic kidneys, I would like to mention the following case,[2] recently reported by Dr. Arthur Dean Bevan in the Journal of the A. M. A. on February 26, 1910.

In April, 1903, the patient complained of pain in the legs and general weakness which lasted until the summer, when he took a rest cure. In July, 1903, the patient had his first attack of pain in the right side of the abdomen. Later a rough ride increased the pain very much. On November 12, 1903, the patient had an attack of very severe pain extending from the right side of the lower part of the abdomen to the right testicle. The pain was relieved by hot fomentations. Nausea and vomiting were present. Tenderness was elicited on deep pressure in the region of the appendix or below. An exploratory laparotomy, performed two or three days later, showed the kidney to be lower in position than normally.

Following the operation there was comparative freedom from symptoms until January, 1905, when he had another attack of severe pain, of the same character as before the operation. Since then there have been

[2] From the surgical clinic of Dr. Arthur Dean Bevan, Rush Medical College, Chicago.

Fig. 1. To illustrate case 1. Differential diagnosis between appendicitis and stone in the right ureter.

Fig. 2. Case 2. Arrows point to suspicious shadows in the pelvis. Resulted as being of intra-ureteral origin by the shadowgraph catheter.

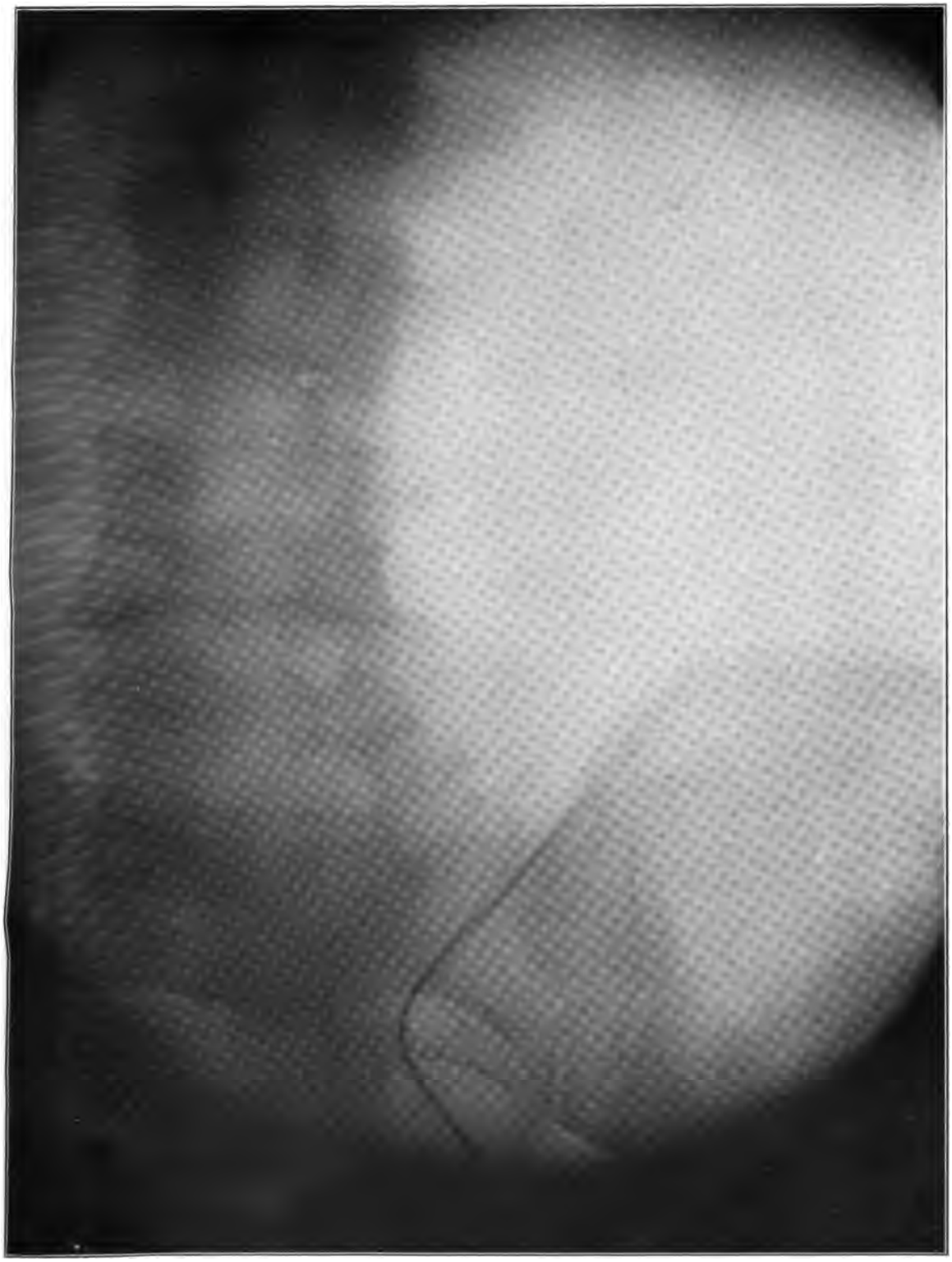

Fig. 3. Case 2. To illustrate the course of the ureter, noting (a) the bend in its course near the spine, and (b) termination of the shadowgraph catheter just above crest of the ileum.

two attacks of severe pain and many darting pains in the troubled area. Blood was noted in the urine six or eight times.

PHYSICAL EXAMINATION

Head, neck, and chest negative. Abdomen, a three inch scar is present in the median line below the umbilicus. Below and to the right of this scar is a mass that can not be definitely outlined by palpation. The mass is immovable and not tender.

The patient re-entered the Presbyterian Hospital on May 17, 1909. Principal complaint on re-admission was pain in the legs which has been present since 1903 and which comes on without any relation to exercise. He has had several attacks of pain localized in the right lower quadrant of the abdomen, not at McBurney's point. One attack in April, 1906, was quite severe, lasting for two or three hours with retraction of the right testicle. Occasionally he noticed some stinging and burning on micturition.

The X-ray picture, taken by Dr. Potter, showed the presence of a shadow the size of a hickory nut, compatible with that of a calculus just below the promontory of the sacrum; stereoscopic views were then made, which showed that the shadow producing mass was situated in front of the sacrum. On one of the projections the mass was seen about an inch to the right of the median line, which corresponded exactly to the point of tenderness.

On account of the right-sided pain and in view of the fact that one of the projections showed the shadow on the right side, it was decided to catheterize the right ureter with a shadowgraph catheter and demonstrate the course of the ureter by the X-ray. The catheter entered the ureteral orifice easily and advanced without any obstruction about one-third of its usual distance, when an obstruction was met and further advance was impossible. After an X-ray was made it was seen that the catheter, instead of proceeding across the synchondrosis in its usual path to the kidney swerved inward to the median line and stopped immediately in front of the shadow. See Fig. 5. After a careful study of the X-ray plate a positive diagnosis of stone in a dystopic kidney was made.

This case brings up the question of diagnosis of dystopic kidneys. Dystopic kidneys are usually of congenital origin and in as much as the case under consideration was of this type, I will consider only the congenital cases. Until recently but little attention was paid to this lesion of the kidney, from a clinical standpoint, and hence the diagnosis before operation has not very often been made. Usually some other pathological condition is suspected and diagnosed, only to have the true state of affairs revealed at the time of operation. (Laparotomy.) It is believed by many authors that congenitally misplaced kidneys are very prone to undergo pathological changes.

In this case a stone was present. The symptoms produced by congenitally misplaced kidneys are very variable. Chronic constipation and backache have frequently been met with. Severe mental disturbances occurred in a case of Israel's as well as in one of Albrecht's cases, and they lay stress upon its presence; they do not look upon the mental symptoms as a purely accidental association. When a dystopic kidney is present in women it has been alleged that it may interfere with menstruation and labor. That this is not always the rule is illustrated by the following case, reported by Lowit:

Patient, female, age 49. Menses began at the age of 13, always regular and of the twenty-eight day type The patient has had six normal deliveries the last ten years ago. Since then she has always been perfectly well. The patient was suddenly seized with severe pains in the lower part of the abdomen, and vomiting. No urinary symptoms, no trouble passing gas or fæces.

Physical examination. Revealed the presence of a smooth, round, not tender, apparently fluctuating, movable tumor. The result of the vaginal examination led to a diagnosis of tumor of the left ovary.

Operation. Laparotomy. After opening the abdomen a retroperitoneal tumor was found and removed, which proved to be a hydronephrotic kidney. Beside the presence of the retroperitoneal tumor, examination of the internal genitalia showed the presence of a uterus bicornis with rudimentary tube and ovary.

In this case the dystopic kidney was associated with the above mentioned congenital anomalies of the internal genitalia. The occurrence of congenital malformations of the internal genitalia with congenital malformations of the urinary tract are well known facts and have been carefully described by Paultauf, Rosthorn, and others.

The all important point in this class of kidney lesions is the question of establishing the diagnosis prior to operation, so that the type of operation to be carried out in a given case can be determined *prior* to the operation. In this case the diagnosis was absolutely established before the operation (stone in a congenitally misplaced kidney), and hence an extraperitoneal operation was carried out.

The operation was performed by Dr. Arthur Dean Bevan. A muscle splitting incision was used, the incision being carried down to the peritoneum, approaching the kidney extraperitoneally. The stone was removed through

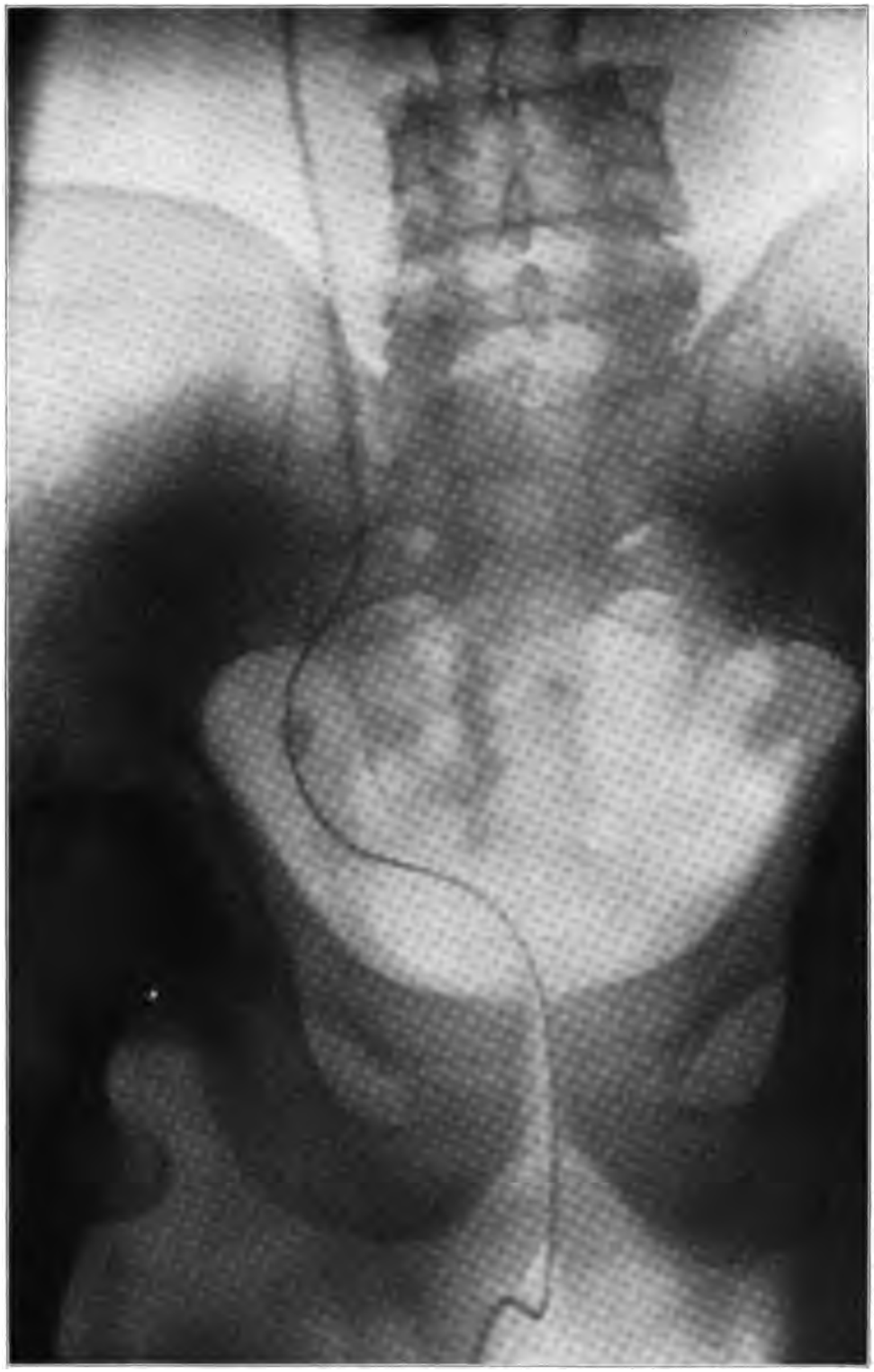

Fig. 4. Case 3. Showing the presence of a stone in the ureter.

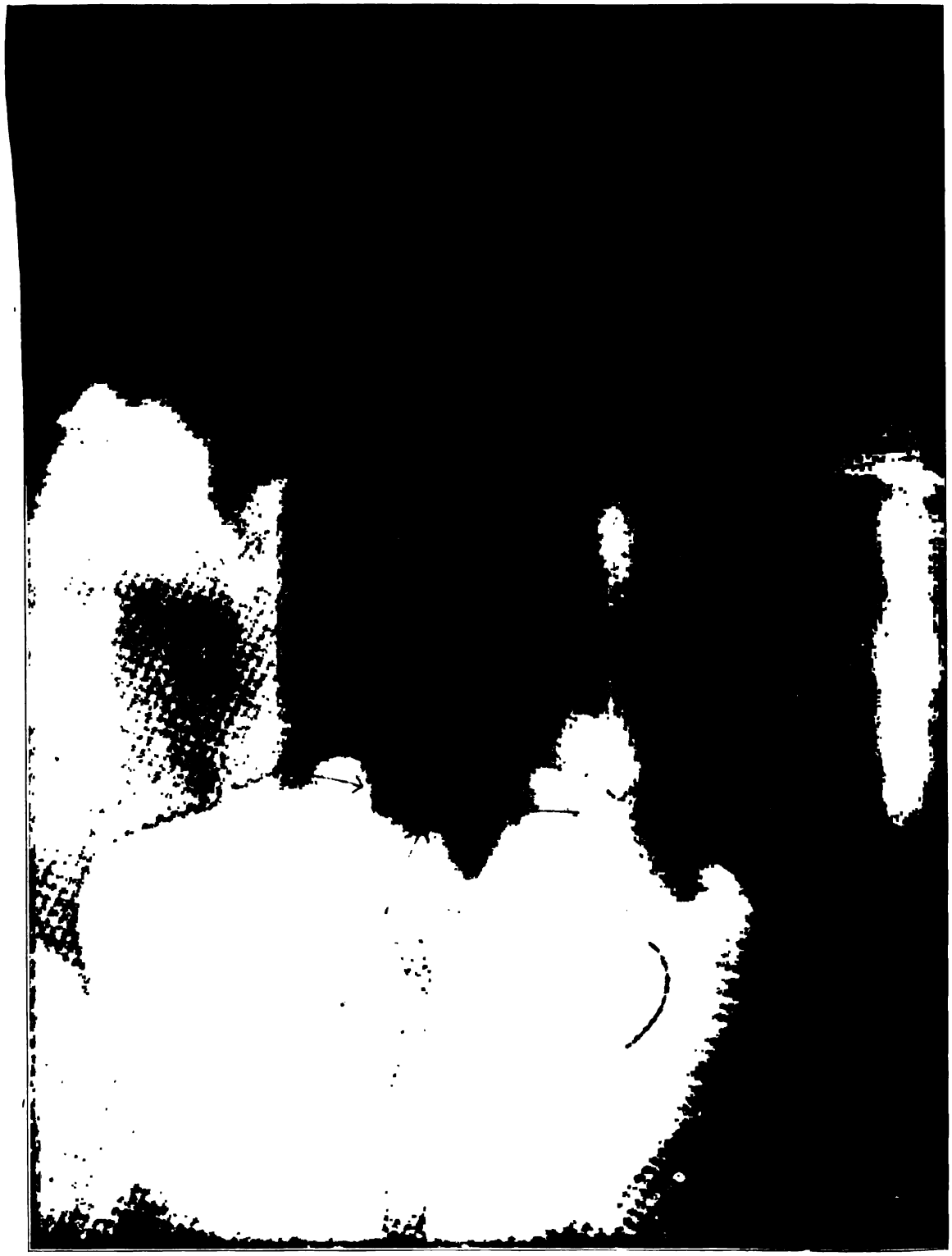

Fig. 5. To illustrate case 4, stone in a congenital dystopic kidney. Note (a) arrows pointing to shadow of stone over sacrum, and (b) the course of the ureter.

a pyelotomy incision. Closure of the incision with catgut sutures. Small cigarette drain placed down to the pelvis of the kidney. Musculature closed with catgut. The patient made an uninterrupted recovery.

A positive diagnosis in these cases must be difficult when based on the symptoms and the physical signs. Various rules have been laid down with this object in view. Wehmer mentions the following:

1. Demonstration of a tumor lying on the sacrum or the promontory.

2. Positive demonstration of the absence of the kidney on the same side.

3. Temporary occurrence of pyuria or hæmaturia associated with "Blasenzwang" particularly occurring with the menses.

4. Demonstration of an abnormal course of the rectum by means of air dilatation.

5. Excluding the origin of the tumor coming from other pelvic organs by means of palpation.

To these Hochenegg has added:

6. Demonstration of a palpable pulsation on the anterior surface of the tumor.

7. Demonstration by means of a ureteral catheter of an appreciable difference in the length of the ureters.

Standing out in a most marked contrast to these many doubtful and unreliable symptoms and signs, as well as the resort to an exploratory laparotomy, for a retroperitoneal condition, is the use of the shadowgraph catheter. By its employment in a doubtful case, we can absolutely and positively establish a diagnosis of a dystopic kidney. Whether the condition is of congenital or acquired origin can then be determined at the time of the operation. Measuring the length of the ureter as recommended by Hochenegg, has a loop hole through which an error may creep in and that is namely, in those cases of movable kidney which have later on become fixed. In this class of cases naturally there is no difference in the length of the ureters and the mass in the pelvis may still be kidney, although showing the same length of both ureters. This error may be overcome by resorting to the use of the shadowgraph catheter combined with the X-ray, in which event the catheter disregardless of its length would show the course of the ureter and its relation to the mass in the pelvis.

In the largest majority of cases the diagnosis as already stated is made at the time of the operation. There are several instances however, in which the diagnosis was made before the operation: namely, by Israel, Albrecht, and Richter. The first positive diagnosis of dystopic kidney that was made by the aid of the shadowgraph catheter was reported by Müllerhain in a woman with a pelvic kidney.

The presence of calculi in a dystopic kidney is not of frequent occurrence. Strater in his collection of 67 cases of dystopic kidneys from the literature records one case of Israel and one case of Abrajonoff. The above mentioned case, inasmuch as it is the first case (as far as I know), in which a positive diagnosis of stone in a dystopic kidney was made by this method and in which the diagnosis was confirmed by operation, may be looked upon as a rather unique case.

By the aid of this method Chalzoff made a diagnosis of a dystopic right kidney and absence of the left kidney. This diagnosis was confirmed by autopsy.

That this method can be used in making a differential diagnosis between floating kidney and a floating spleen is illustrated by the case of Illyes, whose patient presented this problem for diagnosis. The shadowgraph catheter was introduced and the X-ray picture showed the kidney and ureter to be in their normal position. This diagnosis was verified by laparotomy.

POST-OPERATIVE INTESTINAL OBSTRUCTION[1]

By GEORGE WOOLSEY, M. D., New York City, New York

WHETHER it occurs as a complication of convalescence or months or years after the abdominal section, there is no other condition that more imperatively demands early diagnosis and prompt relief. In the one instance it may occur when the anxiety of both the surgeon and patient alike has begun to relax with the establishment of convalescence; in the other, it often comes like a thunderbolt out of a clear sky when the operation and its cause are things of the past, and there is no thought of a lurking danger in the few remaining adhesions. In spite of the improvements in technique in intraperitoneal operations, this complication occurs not uncommonly, for, by very reason of the improved technique, the number of such operations has been vastly increased. In the case of septic or paralytic obstruction, however, modern technique has greatly reduced its relative frequency.

In the past five years there have been 50 cases, recorded as post-operative and post-inflammatory intestinal obstruction, treated at the Presbyterian Hospital, 60 per cent of which were complete and 40 per cent partial obstructions. Of these, only 6 have been instances of paralytic obstruction, while adhesions were noted in 19, bands in 12, and both bands and adhesions in 10, causing strangulation in 9 cases, volvulus in 2, and angulation or a valvular closure (ventilverschluss) in most of the other cases. Nine of these have been in my service (8 operations, mortality 12.5 per cent) and I have had an equal number during that time in private practice and in my service at Bellevue Hospital. The statement has been made by a writer (1) on this subject, six years ago, that the majority of cases occur within two weeks of the operation. This has not been my experience, and of the 50 cases above mentioned, 70 per cent occurred after the two weeks' period. Perhaps the improved technique in the operation and after treatment of cases of septic peritonitis has so diminished the number of cases of paralytic obstruction as to account for this great difference in percentage.

There are so many interesting questions involved in the etiology, diagnosis, prevention, and treatment that the subject is an absorbing one. It is one also that concerns all surgeons. As to classification we have already intimated that cases may occur early or late, according to Broca's division. The late cases are all of mechanical origin; the early cases may be mechanical or paralytic.

The cases of mechanical post-operative obstruction may be due to *strangulation*, when the circulation is interfered with from the pressure of a band or from a volvulus, or both, or to an *obturation*, due most often to an angulation by the kinking of the gut and the formation of a valve-like arrangement, preventing the contents of the distended proximal segment of the loop passing into its distal segment. In time in a mechanical obstruction the gut may become paralyzed, by reason of overdistension, so that the two forms may be associated in one case.

Paralytic obstruction is most often, but not invariably, due to sepsis. There are a few interesting cases of paralytic obstruction, which depend upon disturbances of the innervation or circulation of the bowel, the so-called adynamic obstruction. In a few cases also the temporary paralysis due to handling of the intestine seems to have been unduly prolonged so as to cause obstruction. The above classification is a convenient one in studying these cases.

Etiology. The two great etiological factors in post-operative obstruction are either of a septic or a mechanical nature. The etiology of mechanical obstruction is not difficult to understand, though the mechanism is varied. When due to strangulation, the cause is usually a band or a volvulus, or both. I have recently operated on an example of the latter type where a band, due to an operation thirteen years before, had so narrowed the mesentery

[1] Read before the American Surgical Association, Washington, May 2, 1910.

at the base of a loop of ilium, as to render volvulus an easy matter. In addition, the band, itself, tightened by the twist of the volvulus, strangulated the mesentery and compressed one end of the loop. Resection of fourteen inches was done and recovery was uneventful. In strangulation there is usually an obturation, at one or both ends of the loop, from the band or volvulus, but the important factor is the stasis of the blood supply. Thrombosis occurs in time, and may subsequently extend. Whether the nerves that accompany the vessels are paralyzed by pressure or not is of little moment, for the mesenteric or Auerbach's plexus is capable of carrying on peristalsis independently. When, however, the blood supply is entirely cut off from this plexus, paralysis of the gut soon follows in the same way as it does in cases of thrombosis of the mesenteric vessels. Hence, in strangulation we eventually have a combination of mechanical and paralytic obstruction. The importance of early diagnosis and relief is evident in order to prevent or anticipate the occurrence of paralysis and gangrene of the loop of gut. Fortunately, the onset of strangulation is often gradual and not complete at once, so that by early operation we are able to relieve the condition without intestinal resection. The band causing the strangulation I have found due to an adherent omentum, an adherent loop of intestine, or, more commonly, an old adhesion.

Obturation. A band of adhesions may also cause a simple obturation, without strangulation, if it compresses the bowel transversely to its long axis, and thus does not cut off its circulation.

The commonest form of mechanical obstruction depends upon a kinking or angulation of a loop of gut due to its adhesion to the parietes or another loop. This I have found most often in or just above the pelvis and the small intestine is the part involved, as it is also in the vast majority of all cases of post-operative obstruction (95 per cent, Gibson). Intestinal adhesions are exceedingly common for they follow almost all abdominal operations and most peritoneal inflammations to a greater or less extent. In the past sixteen months I have operated on two cases of obstruction, due to adhesions, with a history of an inflammation some time before, but no operation, and three others of the 50 cases collected at the Presbyterian Hospital during the last five years were of this nature. We know that most of the peritoneal adhesions formed become stretched, attenuated, and disappear, largely under the influence of repeated peristalsis. Some that are firmer than others and those existing where the source of infection is still present, may remain, or, if in the latter category, may increase. But we know from our experience in operating on many cases presenting peritoneal adhesions, that by far the greater number of these do not give rise to obstruction. Post-operative obstruction often follows the cases in which we little expect it and not the worst cases. In acute suppurative appendicitis, and in peritonitis from other causes, many intestinal loops adhere, and are held together in a normal and not in an abnormal position, as after some operations where the intestines are much handled. Otherwise, obstruction would be more common after unoperated appendicitis than it is.

The factor that seems to determine the obstruction is the adhesion of a loop of gut in an abnormal position. Hence, also the disadvantage of opening an acute appendicitis requiring drainage to the inner side of the cæcum where the drainage tract may result in adhesions of the small intestine to the cæcum. Hawkes (2) has found such adhesions to be the cause of the obstruction in several cases. In operating for obstruction I have often found a loop of small intestine angulated by adhesions to the bottom of the pelvis, where it did not normally belong. The method of floating the intestines into place by pouring in hot normal saline solution at the end of the operation, is therefore a rational one.

Another factor to be considered in the matter of adhesions is a personal idiosyncrasy to the formation of firm adhesions, and often of many such. In most cases of mechanical obstruction a few firm adhesions, or only a single one, are found, and the greater part of the peritoneal cavity is free from them. I have observed this idiosyncrasy to adhesion formation in three or four cases, and it has been referred to by others. Thus, Lillienthal thinks that such idiosyncrasy is more common among women. About three

and a half years ago I operated on a young woman of nineteen (No. 3385 Presbyterian Hospital) for partial obstruction. This was the fifth operation for obstruction since an operation for appendicitis two years before. Here, in spite of the removal of the appendix there were many adhesions causing the angulation of two or three loops of small intestine without producing complete obstruction. The attempt was made by the use of the Cargile membrane and omental grafts to prevent the adhesions re-forming, but I heard of her a few months later as being again in a similar condition, and suggested the use of thiosinamin or fibrolysin. I have also seen two young men who had been operated several times for obstruction after appendectomy. They both presented symptoms of obstruction, with very great distension, but refused further operation. One was partly relieved by repeated enemata. Brewer has also reported a case in which there had been eleven laparotomies, six of which were for obstruction.

The usual mechanism of the obstruction occasioned by kinking or angulation, whether due to adhesions or to great distension, is after the manner of a trap (ventilverschluss). Thus, the gas or fluid contents in the proximal or oval arm of the loop presses the distended outer end of this arm against that of the distal arm and closes it, as the ureter is closed in a case of high implantation of the pelvis, by the pressure of the fluid in the latter. The adhesion draws out the two arms of the loop so that they are parallel and in contact, so that distension in one tends to close the other, and it prevents the bend of the loop from being straightened out by the peristaltic action. Fischer(3) reports three autopsies for post-operative obstruction, in which the bowel was included in the deep tension sutures of wire, by the peristaltic action, and occluded. These were operated by three well-known surgeons, and he has known of other cases where the bowel was impaled by the suture. Fortunately, such cases are not common.

In many early cases, due to angulation from adhesions, the obstruction is probably not complete until an attack of indigestion or an indiscretion in diet causes an increase in the amount of gas in the proximal arm of an adherent loop.

Another cause of early post-operative obstruction, in cases with an extensive peritonitis, is secondary abscess. These are not infrequently reported, and almost without exception the obstruction is attributed to the adhesions of the intestinal coils forming the walls of the abscess or possibly to a local septic paralysis. I have operated on several of these within the past few years, and without exception the obstruction has been relieved at once by the evacuation of the pus. My own explanation after studying these cases, is that the obstruction is due to the pressure of the abscess. The adhesions are a contributing cause, for they prevent the loops of gut from escaping from the pressure of the abscess which occludes the gut in a valve-like way (ventilverschluss) the abscess taking the place of the collection of gas or intestinal contents in the ordinary mechanical obstruction from adhesions. Or again, an adherent loop may be compressed between the abscess and some firm structure, like the abdominal wall.

Another etiological factor sometimes reported as a cause of post-operative obstruction is the Trendelenburg position. In two or three cases that I have observed this has seemed to be the cause or a contributing cause of obstruction. Kraske has reported two cases following suprapubic operations, but most have followed laparotomies. It has seemed to me that the intestines, by reason of an abnormal position in which they are left or by the pressure of the rolled-up omentum, can not readily expel the gas, and become more and more distended until the distension, by kinking them and rendering them paretic, continues and increases the trouble. Hence, the importance of letting the patient down and replacing the intestines and omentum in good position (as by floating them into position) before the wound is sutured.

In *paralytic* obstruction, the etiology is not always the same. A nearly similar result may be brought about by a septic peritonitis, handling of the intestines during operation, and direct or indirect disturbance of its nerve supply in extraperitoneal operations, or injuries. Of course, septic peritonitis is the most common factor, but exactly why or how it causes the paralysis is not definitely known. It may be due to reflex action, vaso-motor

disturbances or the direct effect of the toxins on the intestinal nerves or musculature. In the last analysis it must be through some action on the intestinal plexus or muscle fibres. We know that peristalsis is a co-ordinated movement, having its local reflex center in Auerbach's plexus, and that it can go on for a considerable time while the plexus is entirely disconnected from the central nervous system.

Cannon and Murphy have demonstrated that peristalsis may be reflexly inhibited through the splanchnic nerves. In a case of Kocher's the obstruction was due to reflex intestinal paralysis, due to strangulation of the omentum. I have observed a similar condition in a case of torsion of the omentum. A remote inflammatory focus, as in the pleura, may have a similar result, and I have known of it in pneumonia. In all these cases the intestinal paralysis is of reflex origin, and this is probably a common cause.

Another explanation accounts for the production of some cases. The handling of the intestine at the operation is followed by its paralysis for a few hours,— up to twenty-four or more. If it is unusually prolonged the paralyzed gut may become overdistended by the gases developed from the intestinal contents. Many, if not most of the mild cases of post-operative intestinal paralysis, are due to such a mechanical injury, while most of the severe cases depend upon sepsis.

Overdistension may lead to paralysis of the bowel as of the bladder and the paralysis is thus continued. Overdistension may also cause obstruction by kinking the intestine, and if the latter is so paretic that it cannot overcome the angulation, obstruction occurs from the same valve-like mechanism as when due to adhesions. Possibly paralytic obstruction may also be due to traction on the nerves of the mesentery in opposite directions by distended coils lying on opposite sides. Distension may also lead to volvulus. This same overdistension may occur with mechanical obstruction, and thus add a paralytic to a mechanical condition as a cause of the obstruction.

Israel (4) has reported two cases of isolated drum-like distension of the cæcum following an extraperitoneal kidney operation. Here, either the intestinal plexus was directly damaged or reflexly inhibited through the nerves connecting it with the abdominal ganglia. It is also well known that a blow on the abdomen may cause a paralysis of the peristalsis for some time, and the same cause has also resulted (5) in a ring-like stricture from an injury of the bowel wall.

It has been held that the overaction of the bowels, as seen in mechanical obstruction, results in their paralysis. This is denied by v. Stockum (6) who says that continued increased peristalsis does not lead to intestinal paralysis but to hypertrophy, a paresis never results. This is illustrated in the obstruction due to intestinal carcinoma.

The terms dynamic and adynamic obstruction are often used interchangeably and thus lead to confusion. Strictly adynamic obstruction is the paralytic form and dynamic is the rare form, due to a spasmodic contraction of a segment of gut, which has been shown experimentally to be of possible though rare occurrence. Little is known of it clinically, and we will not consider it further. In Mikulicz's very satisfactory classification into mechanical and dynamic obstruction, the latter includes all forms that are not of mechanical origin. To avoid confusion, it seems better to call the dynamic forms paralytic obstruction.

Sixteen years ago nearly all reported cases followed gynecological operations; to-day the majority follow operations on the appendix. This is natural, in view of the great numbers of such operations and the presence of the inflammation which of itself would give rise to adhesions. There can be no doubt that the extent and character of the adhesions, and the occurrence of early obstruction, are much influenced by the amount and character of the drainage, the technique of the operation itself, and the post-operative treatment. In only one of the 50 collected cases was the appendectomy an interval operation, five years before, though many such cases are reported. Pelvic operations form the second commonest cause, and of these, singularly enough, ovarian cysts are followed by obstruction relatively more often, than pyosalpinx, in which the conditions would appear more favorable. In the 50 cases I collected at the Presbyterian Hospital, 32 followed appendicitis, of which 3 had not been

operated, 13 pelvic conditions (5 ovarian cysts), 2 those of the stomach, and 1 a gall-bladder operation. In one case following an operation on the stomach a small segment of ileum was so twisted in its longitudinal axis as to cause obstruction. The patient had taken the anæsthetic badly and loops of small intestine had to be replaced within the abdomen, at the lower end of the incision, repeatedly during the operation. Such a mechanism of obstruction must be most uncommon.

Among those 50 cases, 33 were females and 17 males. The age varied from six months to seventy-three years, averaging 27.4 years. The average age of cases of complete obstruction (22.3 years) was very noticeably lower than that of the cases of partial obstruction (35.3 years). The average duration of acute symptoms in 26 of the cases of acute obstruction, in which this detail is given, was three days and rather less in the 9 fatal cases than in the 17 cured cases. In the cases following appendicitis the time between the first operation and that for the obstruction varied from six days to sixteen years, and averaged a little over two years; in the pelvic cases it varied from two days to sixteen years, and averaged over two and a half years. The total mortality of the 48 operations was 37.2 per cent, that of the partial obstructions, 35 per cent, as compared with 38.7 per cent in complete obstructions.

As to the pathology of the fatal result in cases where the condition is not relieved or relieved too late, we can readily understand the cause in septic or paralytic cases with peritonitis, and in cases of strangulation where the bowel becomes gangrenous, leading to peritonitis. Roger, of Paris, MacCullum, and others have found bacteria circulating in the blood in great numbers in such cases of obstruction in the ileum and colon.

In cases of mechanical obstruction without strangulation, the problem is more complicated. Absorption of one thing or another from the bowel contents has been generally credited as the important factor, but this is now disputed. Experimentally it has been found (7) in rabbits that there is no bacteremia in fatal mechanical obstruction when there are no bacteria in the peritoneal cavity, i. e., when there is no peritonitis. In such cases death was attributed to autointoxication from the decomposed intestinal contents. Thus, Nesbitt (8) found in the afferent loop of complete obstructions of the lower ileum the constant presence of neurin if food containing much lecithin had been ingested. Others (9) have isolated putrescin in a strangulated loop. The absorption of these and other very active poisons would account for the restlessness and great prostration in these cases, and explains the benefit of washing out the stomach or emptying the efferent loop. Treves has stated that the establishment of an opening in the bowel above an obstruction which has been found and relieved has reduced the mortality by fifty per cent.

But Braun(10) claims that this autointoxication is not the cause, and attributes the terminal sinking of blood pressure to an anæmic or asphyxiated paralysis of the basal brain centers due to the great stasis of blood which one finds in the abdominal viscera,— a bleeding, as it were, into the splanchnic region. This, he says, depends upon the irritation of the intestinal obstruction, and is increased by the exaggerated intestinal and glandular activity. He seems to be led to this view by the resemblance of the pulse and respiration curves to those in death from hæmorrhage. The injection of animals with the poisonous intestinal contents gave results in no wise resembling ileus in its symptoms or the pulse and respiration curves. According to this view, the drainage of the bowel above the obstruction by an enterostomy works favorably, not by the removal of the poisonous intestinal contents, but by decreasing the circulation in the abdomen. F. T. Murphy's experiments have led to a somewhat similar conclusion, namely, that the collapse so often observed in severe cases is largely due to a vasomotor paralysis, in the production of which the obstruction of the venous flow seems to be the essential factor. These views as to the pathology of the fatal effect of obstruction are in some measure confirmed by Maury's (11) experiments on the cause of death in obstruction of the bowels within the first or oral 35 cm. from the pylorus. He found that the animals died just the same when the possibility of absorption of decomposed food was eliminated by previous fasting and

through purgation. He attributes the animals' death to absorption of toxins in the duodenal secretions, but as these toxins are neutralized by intestinal antitoxins if the obstruction is placed more than 35 cm. from the pylorus, this explanation applies only to cases of arteriomesenteric obstruction, and not to the cases of obstruction most commonly observed clinically. In all the several explanations the drainage for passage of the contents retained above the obstruction is of the greatest service therapeutically.

Diagnosis. The diagnosis of mechanical obstruction occurring late, weeks, months, or years after the operation, is not usually difficult. There is pain coming on suddenly, with colicky exacerbations, more or less localized to the region of the obstruction, but often referred to the epigastrium; nausea with vomiting at once or after an interval varying with the distance of the obstruction from the stomach; no passage of fæces or flatus, or none after one or two passages emptying the bowel below the obstruction; increased peristalsis and in time increasing distension, often asymmetrical. There is usually tenderness, often localized, in the region of the obstruction. The temperature is not elevated at first, and may be subnormal and the pulse may be somewhat rapid or nearly normal. The leucocyte count and indicanuria are both increased, but are of little value, as they are increased in so many other conditions. The diagnosis is evident without these aids.

Can we distinguish between strangulation and obturation? In many cases, yes, but not always. The so-called "peritoneal shock" is an early sign of strangulation. In this condition the pulse is rapid, the surface pale and cold, the temperature subnormal, and the face is anxious. I have found the pain in strangulation much more intense and persistent and the exacerbations more frequent than in obturation. But in practice, the differentiation is often very hard, especially as they may be combined even from the outset. Only in the subacute cases or those of partial obstruction, can there be any question between obstruction and a colic from other causes. The lack of a history of the ingestion of indigestible food or of a sudden chilling of the body, of a diarrhœa, of a lead line on the gums or of an occupation to warrant lead poisoning, of a history or signs of tabes, etc., enables us to make a correct diagnosis. In all these cases the history and scar of a previous abdominal operation are suggestive of the cause. A good rule to go by, if in doubt, is to perform laparotomy at once, if a moderate dose of morphine has to be repeated to control the pain.

Can we locate the situation of the obstruction? It is very desirable to do so, both with reference to the part of the intestine, and to its position in the abdomen. The abdominal scar helps us, but often not very precisely, for the obstruction may be at a considerable distance. The position of the initial pain, of the tenderness, and of the first appearance of distension, assist in determining the position of the obstruction. In thin subjects the exaggerated peristalsis can sometimes be seen, in stouter subjects be heard, to end at a definite point, but we can not localize it quite so well by auscultation. The early or late onset and the frequency of the vomiting, and the character of the vomitus, help us in judging whether the obstruction is high or low in the bowel. Occasionally the distended loop of a strangulation or volvulus has been made out by inspection by reason of the asymmetry of the abdomen or by palpation by reason of its increased resistance (von Wahl's sign). But when all is said the diagnosis of the position of the obstruction is uncertain, and I have been mistaken when I felt quite sure of the site of the obstruction. In post-operative obstruction we know that the site of the obstruction is in the small intestine in, at least, 85 per cent (Gibson), so that it is largely a question of high or low in the small gut. I have found the adhesions most often in the pelvis, even in cases following appendicitis. Hawkes mentions finding them most often at the inner side of the caput coli.

In *early cases*, those occurring in the first ten to fourteen days after operation, the diagnosis is not so simple, but is often obscured by conditions which necessitated or were present at the time of the previous operation, i. e., infection, trauma, sequelæ of anæsthesia, etc. If there was no peritonitis at the time of operation and no signs of any since, obstructive symptoms indicate mechanical obstruction

except in the first day or two, when they may depend upon a post-operative intestinal atony.

In cases where peritonitis was present on operating, the conditions are more complex. We must here diagnose between spreading peritonitis and obstruction. Peritonitis itself, especially if it is spreading, gives many of the symptoms indicative of obstruction, pain, nausea, vomiting, etc., and the symptoms of the two conditions are so nearly identical that the diagnosis is often difficult and at times impossible.

In obstruction the pulse is quiet, full, and regular until the patient becomes toxic, the pain is more paroxysmal, the vomiting may be of larger amounts and less frequent, and there is little if any rise in temperature at first. If the initial rise of temperature of the peritonitis has approached the normal after operation, a further rise of temperature at the onset of the obstructive symptoms indicates a peritonitic cause, i. e., a spreading peritonitis or a localized secondary abscess. The leucocyte count, differential as well as general, is of doubtful value, but a low count helps to exclude inflammation and it is not as likely to rise or be as high in obstruction as in peritonitis. According to Javel (12) facies abdominalis, as an early symptom, speaks for peritonitis or strangulation and one of the earliest signs of peritonitis are hyperæmic spots on the forehead. Frequent micturition suggests a local peritonitis, and restlessness and excitement indicate peritonitis, though, in my experience, they are quite as characteristic of obstruction. Javel also affirms that a general peritonitis can progress with a normal frequency of pulse. Rigidity is a most important sign of peritonitis, but may be wanting when the patient becomes very toxic. Furthermore, in most of the class of cases under consideration, obstruction, if present, coexists with peritonitis, so that the diagnostic requirement is to distinguish between peritonitis alone and peritonitis plus obstruction. Constipation is the main thing. This, or the reverse, may be present in peritonitis, but gas or fæces are likely to be passed after enemata; not so in an obstruction which does not yield. If repeated enemata of various kinds, and perhaps the moderate use of cathartics, are not followed by the passage of gas or fæces, and especially if other signs of obstruction are also present, such as colicky pain, vomiting, distension, etc., we should diagnose and treat the case as one of obstruction for the safety of the patient.

Again the question arises after diagnosing an early post-operative obstruction, where peritonitis is or has been present, can we distinguish between the mechanical and the paralytic forms? This is very essential as the former is very amenable to operative treatment, the latter much less so. It is often difficult and in many cases impossible to differentiate between them. The sudden onset of pain is indicative of volvulus or strangulation. The pain is more severe and persistent in mechanical obstruction than in the paralytic form. Corresponding to this we find that the peristalsis is much increased in mechanical and diminished in paralytic obstruction. In mechanical obstruction the patients may assume peculiar positions to relax the abdomen and its viscera, while in paralytic obstruction they lie more quietly on the back with the knees drawn up. Vomiting comes on later in mechanical obstruction, unless it is in the upper bowel, and in the paralytic form there are more frequent regurgitations of a dark fluid from the stomach. Distension too, may be more marked, and more uniform in paralytic obstruction. After all is said, it may be impossible in the individual case to diagnose the mechanical from the paralytic form and we must be guided by this fact in the treatment.

In all cases of post-operative obstruction, the possibility of an acute dilatation of the stomach or arterio-mesenteric ileus, should not be forgotten. In my experience, this is of more common occurrence than generally recognized. It may come on with a sudden or a more gradual onset in the first few days after operation. There may be acute or diffuse abdominal pain in the early stages. Vomiting of large quantities of yellowish or greenish, sour-smelling fluid at frequent intervals, with little or no effort, distension of the upper abdomen, rapid pulse and respiration, and normal or subnormal temperature, great restlessness, an anxious expression, great prostration, intense thirst, scanty urine, and constipation, are the principal symptoms. The constipation

is not absolute, flatus is often passed after enemata, and occasionally watery stools have been observed. There is usually succussion over the stomach. There is little or no tenderness, rigidity, or leucocytosis. The use of the stomach tube will confirm the diagnosis. It would seem that the diagnosis would be easy, but experience in the past has proved otherwise. However, if one has once seen the condition and has it in mind, I do not think the diagnosis is difficult. The causative effect of prolonged narcosis has been mentioned by several writers, and in the first case in my experience in which the condition was recognized, the patient had been under the influence of chloroform for two days before operation on account of intense pain, not relieved by morphine. This case yielded to treatment. Finally, it must not be forgotten that exceptional cases of post-operative obstruction are lacking in some or several of the characteristic symptoms of that condition. Thus, Rogers reports a case where there was gangrene under a band in the jejunum without any pain, rigidity, or distension.

Treatment. This resolves itself into prophylaxis and treatment proper, of which the former is fully as important as and often more successful than the latter.

Prophylaxis. Can we avoid post-operative obstruction or lessen the frequency of its occurrence? Practically all cases are due to sepsis, operative trauma, or adhesions. The problem, then, is to prevent or lessen the frequency of the occurrence of these three factors. If the rule of operating for appendicitis in practically all cases as soon as the diagnosis can be made were generally followed, most cases of septic or paralytic obstruction would be avoided. In the presence of septic peritonitis a rapid operation, avoidance of trauma to the peritoneum, the use of the continuous drip enema and the Fowler position, the avoidance of food or catharsis by the mouth, and the employment of milk and molasses and similar enemata to relieve distension, will cure most cases of spreading peritonitis and prevent the occurrence of paralytic obstruction. An intravenous saline infusion helps in the elimination of the toxins, and is an excellent stimulant, thus serving a double purpose.

After evacuating some of the pus of a septic peritonitis at the operation, the introduction of sheep serum or, better still, the concentrated antiferment serum (ascitic fluid, etc.) may be effective in checking the peritonitis and preventing septic ileus.

A nearly opposite plan is employed and advocated by some. Thus, Heile thinks early bowel movement gives the best result and tries to excite peristalsis directly after the operation so as to distribute the germs, increase the hyperæmia of the peritoneum and the autolysis and resorption of the pus. To this end he injects 50 to 100 cc. of warm castor oil into the intestine during the operation, and the next day he employs enemata, physostigmine, etc., energetically, until a good result is obtained. He also uses a saline infusion, and claims that his mortality has been much lowered by the use of this method. Along the same lines, McCosh formerly employed and advocated an injection of mag. sulphate into the bowels during operation, and I have used it in a few cases. As these cases were among the worst of their kind, it is difficult to estimate the value of the method.

Several report the use of eserine (physostigmine) salicylate, given prophylactically, before and immediately after operation, and claim good results. Among German surgeons atropine has been similarly used quite a good deal, but many condemn it. I confess that I like to see the bowels move early under certain circumstances in septic peritonitis, i. e., when distension is marked and increasing. Not only is meteorismus an indication at times of intestinal paralysis, but it may of itself cause it. When distension is marked and increasing, I employ lavage and give an enema of milk and molasses, p. e., or one containing ox gall, spts. turpentine, and emulsion of asafœtida, or sometimes one containing alum, repeating these if needed. Hot stupes to the abdomen are also useful. Often great quantities of gas are passed, perhaps there is a good fæcal result as well, and the condition is relieved. But if the distension quickly recurs, or is not relieved at first, I have several times used one-sixtieth to one-thirtieth grain physostigmine salicylate hypodermically, repeating it q. 2 h. for two or three doses, and the result has not infrequently

been very satisfactory. I have never seen any bad results, and have never used it as a routine treatment. Too great faith in physostigmine or atropine interferes with careful diagnosis, and postpones more effective treatment.

It is in cases of post-operative intestinal atony that this treatment with physostigmine is most clearly indicated. This atony is largely due to the handling of the intestines and is normally temporary, but I have several times seen it lead to great distension which increases the paralysis, and leads also to angulation.

It is in the early period of distension that the use of physostigmine, combined with enemata and lavage as above described, works like a charm, and the entire aspect of the case is changed in a very short time. There may or may not have been peritonitis of moderate extent present when the case was operated, and the appearance on the second day p. o. is that of obstruction or a condition very close to it, with distension, vomiting, pain, restlessness, and no passage of flatus or fæces. The result of the above treatment in such cases is often most satisfactory.

As it has been shown by Cannon and Murphy that this local post-operative paralysis is largely due to handling,—even the gentlest handling, of the intestines, and that its duration is in proportion to the amount and roughness of the handling, it follows that there should be as little and as gentle handling of the bowels during operation as possible. These experimenters showed that unusual cooling or exposure to the air of the bowels, under aseptic precautions, and a long etherization of the animal, produced no appreciable paretic effect on the bowels.

Since employing the above plans of treatment I seldom see clearly post-operative obstruction due to septic or post-operative paralysis.

I agree with Peck (13) that careful post-operative treatment is of the greatest importance in the prophylaxis of obstruction. Not infrequently, an attack of indigestion and the formation of gas distending the bowel already adherent, perhaps paretic, and partially obstructed, will induce an attack of obstruction which might have been averted if the patient had been carefully watched, warmed, and dieted in the first few weeks of convalescence.

Adhesions are a most prolific source of obstruction. What can we do to prevent them? As they are likely to form in an attack of acute appendicitis and are more widespread the more diffuse the peritonitis, we should advise operation as soon as the diagnosis is made or, at least, in the first interval, and not wait for several attacks. I have recently operated on two patients with obstruction due to adhesions from appendicitis not operated upon. For the same reasons other intraperitoneal inflammations should be operated upon without undue delay.

The technique of the operation affects very materially the formation of adhesions. Rough handling and mechanical irritation, drying by exposure to the air, contact with chemical irritants (antiseptics), and the introduction of foreign bodies (drains), promote the formation of adhesions, and should be avoided as much as possible by careful attention to the technique. We no longer use antiseptics on the peritoneum. As Baisch's experiments lead to the conclusion that adhesions depend upon blood in the peritoneal cavity, careful hemostasis is very desirable.

A fruitful source of adhesions is drainage. The use of drains is avoided altogether if we operate early enough. No gauze drains should be used unless covered by rubber tissue or tubing. Dr. F. T. Murphy has demonstrated that gauze drains are walled off by adhesions more rapidly than glass or rubber tubing or rubber-tissue wicks, and that a cigarette drain does not drain the general peritoneal cavity after eighteen hours. Hence, drains should be avoided if possible, they should not be left in long, and they should be of a non-irritating substance, rubber tissue or tubing unless the object is to wall off a local septic process. Moreover, the position of the drains is a matter of primary importance. As far as possible they should be bounded on one side by parietal and on the other side by visceral peritoneum and not on all sides by the latter, to diminish the chances of obstructive adhesions. Hence, if in a case of appendicitis with peritonitis, it is necessary to drain the pelvis, the drain should pass down outside the caput coli, between it and the iliac fossa, and not to its inner side among the intestinal coils where the adhesions

will bind these coils together and to the cæcum. In the pelvis a barrier of omentum may be used to protect the intestinal coils. The removal of a drain internal to the cæcum is also more apt to twist or displace the contiguous coils. Hence, for drainage the muscle splitting incision is better than the Kammerer.

As absorption of adhesions occurs earlier and more evenly if the focus of infection is removed, the appendix should always be removed if possible. I cannot agree with the statement made that mechanical obstruction is more often due to appendicitis not operated upon than to appendicitis operated upon, because the focus is not removed in the former case. For obstruction is not so much due to the number or firmness of the adhesions, as to adhesions which hold the bowel in an abnormal position. For this reason, we should avoid as far as possible, the displacement of the intestines during operations or, at least, we should try to replace them by floating them into position or otherwise, and prevent their adhesion to the wound and to raw surfaces by interposing omentum.

As areas denuded of peritoneum invite adhesions of the firmest kind, they should be covered by peritoneal suture, omental graft, etc., as far as possible. As after any intraperitoneal operation, especially if there is much handling or exposure of the bowels, adhesions are liable to form, many have attempted to solve the problem of preventing or minimizing these adhesions, but with only partial success. The prevention of post-operative adhesions is mainly a matter of general technique and not of any one procedure or remedial agent. Rigid asepsis; prevention of cooling or drying of the exposed parts by the use of hot salt solution, by keeping them covered, and by rapid operating; avoidance of undue handling, by proper position, etc., and of unnecessary packs and pads; avoidance of raw surfaces by covering them with peritoneum or omental grafts; early establishment of peristalsis and catharsis by enemata, physostigmine, etc.(13); frequent change of position after operation; these and perhaps other similar measures may, under ideal conditions, assist in avoiding adhesions, save perhaps the very finest, and they are soon dissipated by peristalsis. But most operations do not offer such ideal conditions, or the problem may be to prevent the re-formation of adhesions that have had to be broken up during the operation.

Can we prevent the re-formation of existing adhesions? Not with our present knowledge. The best we can do is to minimize them. This problem has been approached experimentally, and various methods tried on animals and then on the human subject. The variety of methods used and of substances interposed between raw surfaces to prevent their adhesion by fibrin and later by fibrous tissue is very large, and we can only enumerate them. Normal salt solution floats the bowels well into place, but does not separate them,— they merely float on it. Cargile membrane, collodium, and a film of aristol fail. Charring by the cautery prevents, milder cauterization produces adhesions, but the former is not often applicable. Thiosinamine or fibrolysin to soften or dissolve adhesions; phosphorus by mouth, and peptone hypodermically to prevent the formation of fibrin and thereby the agglutination of opposed serous surfaces; non-irritating fats and mucoid substances, such as olive oil, paraffin, tallow, lanolin, agar, and gelatin and mucilage, to form an even thin coating on the serous surfaces, have all been tried and some have found enthusiastic supporters. But unbiased opinion is to the effect that no one is a panacea, though some have a certain value. Blake, of Boston, in a paper before this association, reported experiments in the use of sterile olive oil and concluded that it was harmless in moderate quantity, and that the adhesions were fewer and less dense. Heohne (14) recommends Glimm's method of injecting 30 cc. of sterile 10 per cent camphorated oil into the peritoneal cavity to prevent peritonitis and incidentally adhesions. Gellhorn(15)speaks encouragingly of lanolin,but the best results have apparently been obtained by the use of a thick mucilage of gum arabic. In cases where adhesions have formed, especially where there seems to be an idiosyncrasy to the formation of firm adhesions, I would advise the trial of thiosinamine or fibrolysin.

The treatment of actual obstruction is operative.

Late obstructions. The chances of palliation

are slim and many of the adhesions have disappeared so that the operation is easier. If we can diagnose the variety and position of the obstruction, the operation is much simplified. The incision is made over the site of the obstruction. Otherwise the laparotomy must be in the first place exploratory. In such cases the incision must be ample for exploration and is made to the median side of the scar or in the median line. The collapsed and distended portions of the intestine are the best guide to the site of the obstruction, which is almost always in the small intestine. In all cases the operation must be performed as soon as possible after the diagnosis is made, after a reasonable attempt has been made to move the bowels by repeated enemata of milk and molasses, or enemata containing glycerin or ox gall, asafœtida, and spirits of turpentine. Often cathartics have already been given, but of course these should never be persisted in.

After the site of the obstruction is found the cause must be relieved, adhesions or bands severed between two ligatures, a volvulus untwisted and its predisposing cause, bands or adhesions, narrowing the base of the loop relieved. If the viability of the intestine, in case of strangulation or volvulus, is questionable, the affected intestine should be covered with pads wet with hot saline solution. If the circulation returns in ten or fifteen minutes, and there is no line or area which appears necrotic, the incision may be closed; otherwise, immediate resection of the necrotic area and anastomosis, end to end or side to side, is preferable to an artificial anus, if the condition of the patient justifies it. In some cases if the vitality of the gut at the site of a constricting band is doubtful, omentum may be sutured over it. Obstructive adhesions have formed at the site of the appendix whether the stump is inverted or cauterized. When there is much matting together by adhesions with obstruction, Deaver recommends lateral anastomosis of the afferent and efferent loops, but I have not found the conditions present that would demand such a procedure.

The indications for treatment are not so clear in *early obstructions*. Most of them depend upon sepsis, but some are due to mechanical causes or to both causes combined. The later it occurs after operation the more likely is a mechanical element to be present. In early cases the onset of the trouble is masked by phenomena that we are wont to meet with after laparotomies, especially the vomiting and pain. If the vomiting is unusually prolonged, it is often attributed to increased sensibility of the stomach or to some idiosyncrasy. The surgeon hesitates and employs palliative treatment, he does not want to believe that the complication exists, and dislikes to propose a second operation, and thus he loses the opportune moment. The patient is very restless, with an anxious expression or, from the septic intoxication, becomes lethargic and complains of little but frequent vomiting or gulping of a brownish fluid. The abdomen is distended and the pulse and respiration are much affected by it. Peristalsis is very weak or wanting. The condition rapidly deteriorates and the chances of a successful operation are desperate.

In these cases we must begin early. Lavage should be done where the vomiting is frequently repeated, or is continued beyond the first twenty-four or thirty-six hours. In some cases with continued vomiting, especially where the distension begins in the epigastrium and is later most marked there, I have several times seen repeated lavage, together with turning the patient on the stomach (or knee-chest position), result in wonderful improvement and ultimate recovery. These are cases of acute dilatation of the stomach or arterio-mesenteric ileus.

In all of the cases described above the stomach tube is of great service, and in addition, I use enemata, stupes, physostigmine, etc., as described above. Electricity applied through an electrode in the rectum has been successfully used, but I know nothing of it. If a little gas or gas and fæcal matter passes, this line of treatment is persisted in. If more gas, etc., passes and the distension begins to relax, the adynamic obstruction is often relieved.

If palliative treatment is not effective in the first few hours, operation should not be long delayed, and ileostomy or an exploratory operation must be done. If the trouble comes on some days after operation, if pain is a prominent symptom, and especially if it is paroxysmal or localized and if peristalsis is active, a mechan-

ical cause is to be suspected and laparotomy done, if the patient's condition justifies it. In one case four days after operation, I found a mass of omentum riddled with pus pockets, causing obstruction by its pressure, and its removal was followed by a speedy cure.

If, on the other hand, the symptoms are more those of a septic ileus, ileostomy is indicated. In the most desperate cases this may be done through the opened-up wound. These cases and those where the patient's condition only allows an ileostomy under local anæsthesia, almost always die, in my experience. We must not wait until so late. An earlier laparotomy allows a rapid exploration and perhaps the discovery of a mechanical cause or an overlooked secondary abscess. The latter condition must always be looked for, especially after the first few days. But one must avoid trying to do too much. A tube fastened in by a purse-string suture, inverting the surface of the bowel, is watertight. Through it we may employ repeated irrigation and syphonage of the bowels. This is more effective than simple enterostomy, for it thins the bowel contents and adds syphonage to abdominal pressure to empty the bowels, which are paretic and have little power to empty themselves.

The stomach should be washed out before operation to avoid the danger of aspiration pneumonia and of asphyxia from the vomitus. For the same purpose the operation may be done under local or spinal anæsthesia.

Elsberg(16) has presented the case of enterostomy strongly, claiming that only a small per cent of cases of obstruction are in a condition to justify radical operation, and that in the worst cases and in the large midway class, enterostomy is the best treatment. As to the objections (1) that the cause is unrelieved, he cites two cases to show that it may be relieved be enterostomy alone, and says that if found at once, it may often be safely relieved, but even where it can be relieved, it is often better to save life by enterostomy and relieve the cause later. The objection (2) that a fæcal fistula may remain and require a second operation does not hold in the technique given above. As to the objection (3) that the gut may be or become gangrenous, his statistics show that only 5 per cent of acute obstructions, besides intussusception and volvulus, present gangrene. Enterostomy may prevent threatened gangrene, while if gangrene is found the loop may be brought out of the wound. The danger of leaving gangrenous gut behind is less than that of prolonged manipulations. His results with enterostomy are much better than those I have seen, because the operations were done earlier and not so exclusively as a last resort. McWilliams in reporting statistically on the 1,400 cases of appendicitis operated on in the Presbyterian Hospital, in the last five years, found twelve enterostomies, with a mortality of 83 per cent. Enterostomy is mostly employed in the bad cases of paralytic obstruction. It is inadvisable in early and mild cases, but if enterostomy is done, it should be done earlier than I have seen it done, to get satisfactory results. Multiple enterostomy, with drainage at one or more openings, has proved valuable in the hands of some.

In septic or paralytic obstruction, more than in any other form, prophylaxis is far more important and successful than operative treatment at a later stage. In my experience the general recognition by the profession of the importance of early operation, the improvements in technique and careful prophylaxis, have rendered this most hopeless class of cases of post-operative obstruction very much less common than formerly.

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DEPARTMENT OF
NICHOLAS SENN FESTSCHRIFT

DOUBLE DISTAL LIGATION OF THE COMMON CAROTID AND SUBCLAVIAN ARTERIES AT ONE SEANCE FOR INNOMINATE ANEURYSM

REPORT OF TWO CASES

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IN the title I say ligation "at one seance," in preference to Barwell's term of "simultaneous double distal ligation." The ligations are not simultaneous and could not be, as the carotid is invariably tied first and the subclavian is tied afterwards, although almost at once afterwards.

Distal ligation for aneurysm was first suggested by Brasdor in the ninth decade of the eighteenth century (exact date unknown), and was first performed by Deschamps in 1799. Deschamps's patient suffered from an aneurysm high up on the femoral artery and death resulted from the operation.

In 1815 Hogden claimed that a distal ligature should be so placed that no branch intervenes between the ligature and the aneurysm. Wardrop endorsed this view in 1825, but later abandoned it, and in his "new operation" advocated the application of a distal ligature regardless of the existence of an intervening branch.

Wardrop's famous case (Mrs. Denmark) suffered from innominate aneurysm, although the surgeon believed wrongly that she had a low carotid aneurysm and that the right carotid was obliterated. He tied the third part of the right subclavian. She was very greatly benefited and lived for two years, but the aneurysm persisted (Ashhurst's International Encyclopædia of Surgery).

There is considerable confusion as to the meaning of the terms "Wardrop's operation" and "Brasdor's operation." Matas (Keen's Surgery, vol. v, page 256) says: "In the aneurysms of the innominate artery, if the ligature is applied to the subclavian alone, it is Brasdor's operation that is performed, if applied to both the subclavian and the carotid of the same side, it is Wardrop's operation." The terms are so used in this article.

For many years after Wardrop's report (1828) distal ligation for innominate aneurysm received scant consideration from surgeons, but in 1865

renewed attention was called to it by Mr. Heath, who reported a case of ligation of the right carotid and subclavian. Heath's patient, though an habitual drunkard, lived four years.

In 1877 Barwell operated on his case. He performed Wardrop's operation and cured the aneurysm. The patient died six months later of bronchitis due to exposure (Ashhurst's International Encyclopædia of Surgery).

During the last thirty years the operation has been the subject of occasional discussion and of late years has received considerable attention. All such operations should be reported in order that enlarged statistics may enable us to clarify our ideas and reach positive conclusions.

Certain it is that if distal ligation is of use in any region it should be of value in an innominate aneurysm.

CASE 1. On the 4th of November, 1901, I reported to the Philadelphia Academy of Surgery the record of a patient upon whom I had tied the third part of the right subclavian artery and the first part of the primitive carotid artery for aneurysm of the innominate involving the primitive carotid. The operations were performed at one seance.

The man came from Indiana and had been referred to me by Dr. A. H. Spears, now of Neopit, Wisconsin. The patient was forty-five years of age and a blacksmith by occupation. He had contracted syphilis at the age of twenty. He came to the Jefferson Hospital December 4, 1899. There was a distinct bulging of the first and second costal cartilages, "great pulsation, marked bruit, and distinct thrill." On December 13th operation was performed. First the carotid was tied distal to the carotid aneurysm, then the third part of the subclavian was ligated. The right radial pulse could be detected the third day after the operation.

Five weeks after the operation the man was discharged from the hospital immensely benefited. It was very difficult to detect the aneurysm at all, the bulging of the chest had passed away, there was a slight murmur, and the thrill was scarcely perceptible. The pulsation of the origin of the carotid could be detected, but felt far away. The man returned to his home and, in spite of advice to the contrary, to his occupation. He even shod horses. He remained apparently well for many months, but twenty-two months after the operation he returned to the hospital seeking assistance. There was no apparent return of the old aneurysm, but he had developed a new aneurysm on the common carotid at the point of ligation, and the left carotid was dilated and beat very forcibly. We were unable to suggest any operation for his relief and he went home. Dr. Spears tells me that he lived about three years after the operation. The cause of his death is unknown.

This man was certainly greatly benefited by the operation; there was no cerebral complication from the carotid ligation, there was no circulatory disturbance in the right limb, and had he not returned to an occupation necessitating great muscular effort, the benefit would in all probability have been greater and the improvement would have been more lasting; in fact the new aneurysm might never have formed.

CASE 2. In July, 1907, Dr. Henry D. Moore of Philadelphia referred to me Miss E—. L—, 63 years of age. She was admitted to the Jefferson Hospital July 3d, 1907. She is white, is a single woman, and did housework.

The family history shows no record of aneurysm although one brother died of "paralysis," and one of "heart disease."

When a child she had whooping cough, measles, and scarlet fever. She has never had acute rheumatism, although now and then one or more joints ache, but even when painful the joints never swell. She has had no sickness since childhood. In June, 1906, she fell and bruised the right shoulder severely. About two weeks subsequent to the fall she noticed

a "beating swelling" above the inner end of the right clavicle. The beating became more distinct month by month.

Examination on admission:

A slender, fairly strong woman, exhibiting the evidences of arteriosclerosis. The radials are hard and tortuous and the temporals are tortuous. The lungs are normal. There is a slight friction sound in the 4th interspace of the left side about two inches to the left of the margin of the sternum. The kidneys are sound. The pupils are normal in size, equal, and react normally to light and accommodation. Above the inner end of the right clavicle and back of the sternocleido mastoid muscle there is a pulsating mass. The pulsation is expansile; there is a systolic thrill and a systolic bruit. The bruit is transmitted along the right carotid, but not the left carotid, and apparently not along either subclavian. There is no evidence of disease of the cardiac valves. The heart sounds are weak and indistinct on the left side, but somewhat louder on the right side. The pulse is synchronous and similar in character in the right and left radial arteries. Pulsation is not quite synchronous in the right and left carotid arteries.

There is no pain, no dyspnœa, no dysphagia, no voice change, and no venous congestion of the face or neck. The fluoroscope was not used and an X-ray picture was uncertain.

A diagnosis was made of aneurysm of or near the origin of the right common carotid and it was decided that the innominate should be ligated.

The operation was performed July 6th. The patient was anæsthetized.

In order to expose the innominate the inner end of the clavicle and the sternoclavicular joint were resected, and a portion of the sternum was bitten away by means of the rongeur. I followed Burrell's plan and removed the right half of the suprasternal notch and almost an inch on the right side of the bone below it. The pleura was easily pushed aside and the bifurcation of the innominate was thoroughly exposed about half an inch below the level of the sternoclavicular joint. The right inferior thyroid vein crossed the vessel distinctly below the bifurcation and the left innominate vein could be identified lower down. The innominate artery could have been tied with the utmost ease and operative safety. But alas for surgical ambitions — it was seen that the aneurysm was not carotid but was innominate. The innominate was the seat of a fusiform aneurysm, the bulge involving the entire vessel and being more marked on the left side of the artery than to the right or in front.

First, the common carotid was tied, distal to its origin, with two pieces of number two chromic catgut. The first part of the subclavian was then tied in the same manner. After the tightening of the ligatures the fusiform innominate distended and the pulsation became more marked.

The muscles were sutured with catgut, the skin wound was closed with silkworm gut, and a bit of rubber tissue was inserted as a drain. The wound was dressed. The entire right upper extermity was wrapped in cotton, was placed upon a pillow, and surrounded with warm water bags. The drains were removed in twenty-four hours.

The radial pulse was perceptible on the fifth day, at which time the cotton was removed from the limb. Primary union of the wound was obtained.

Fourteen days after the operation the patient was placed in a chair. While in the chair she fainted and was put to bed again. The next day while up she had a slight attack of weakness. Three days later (July 26th) she went home, the pulsation, bruit, and thrill at the root of the neck being still distinct, but less than before the operation.

From this time she progressively improved. On June 8, 1909, nearly two years after the operation, she was examined for me by Dr. John C. DaCosta, Jr. He found marked pulsation over the old aneurysm, a fine systolic thrill, and a faint and inconstant systolic pressure murmur. Below this area he noticed a delicate diastolic shock. He recorded the second aortic sound as + and aneurysmal in quality, and found a pleuropericardial friction sound in the fourth interspace of the left side.

January 13, 1910 (two and a half years after the operation), Dr. John C. DaCosta, Jr.,

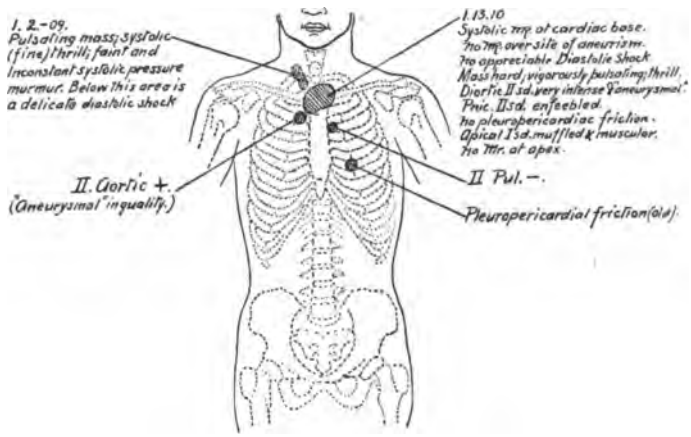
1. 2.-09.
Pulsating mass; systolic (fine) thrill; faint and inconstant systolic pressure murmur. Below this area is a delicate diastolic shock
II. Aortic +.
("Aneurysmal" inquality.)
1.13.10
Systolic mm. at cardiac base.
No mm. over site of aneurism.
No appreciable Diastolic Shock
Mass hard, vigorously pulsating; thrill.
Aortic II sd. very intense "aneurysmal."
Pmc. II sd. enfeebled.
No pleuropericardiac friction.
Apical I sd. muffled & muscular.
No Mrr. at apex.
II Pul.—.
Pleuropericardial friction (old).

Diagram made January 13, 1910, two and one-half years after the operation.

again examined her. He found a systolic murmur over the cardiac base. The murmur over the site of the aneurysm and the diastolic shock below had entirely disappeared. The aortic second sound was intense and aneurysmal. The pleuropericardial friction sound had disappeared. There was no murmur at the apex and the apical sounds were muffled and muscular.

I append the diagram sent me by Dr. John C. DaCosta, Jr.

THE VALUE OF THE OPERATION

Both of the cases here reported seem to have been much benefited by the operation. In case 2 the operation was more severe than necessary because of the erroneous conviction that we were dealing with an aneurysm of the carotid rather than of the innominate. The obtainable detailed record of the first ends with the twenty-second month after the operation. He lived about three years. The second patient is entirely comfortable and all the signs of aneurysm are either abolished or improved two and a half years after the operation.

Two cases do not constitute sufficient experience to enable us to be positive as to the value of the procedure, but they certainly justify a surgeon in viewing innominate aneurysm as a disease for which he may perhaps do much by operation. This view is reinforced by remembering Barwell's case and Heath's case.

There is considerable difference of opinion as to the usefulness of distal ligation in such cases.

Jacobstal and some other surgeons regard the operation as uncertain, dangerous, and though occasionally palliative, never actually curative. Le Dentu, Guinard, Imbert, and Pons assert that it can actually cure. There can be no doubt that at least it can in some cases bring about a symptomatic

cure which appears to be permanent. Matas says it does this in 22 per cent of the cases, almost one-quarter.

Double distal ligation is certainly a dangerous procedure. The mortality has been variously estimated. Statistics of mortality gathered in pre-antiseptic days are now practically useless. Matas estimates the operative death rate (from subsequent hæmorrhage and from brain complications) at 15 per cent, and says that in 30 per cent of cases the aneurysm fails to improve. In an uncertain per cent of the cases which fail to improve there are cerebral complications due to the closure of the carotid. Some surgeons maintain that 25 per cent of patients in whom the common carotid has been ligated for any cause develop brain complications, and that fully 10 per cent of cases operated upon die. The victims of aneurysm may be aged and often exhibit extensive arteriosclerosis, and in them the death rate and the percentage of cerebral complications will naturally be higher than among younger people free from widespread vascular disease. Some surgeons have tied the carotid alone, thus lessening the chance of cure and retaining the chief element of danger in the operation.

Others have tied the subclavian alone and thus lessened one element of danger and at the same time decreased the chance of cure.

Others have done the operation on one vessel first, and followed it after a distinct interval by ligation of the other vessel (consecutive double distal ligation). If this is done the carotid should always be tied before the subclavian.

Up to very recent times it had come to be accepted that the operation to be performed, if any is done, is double ligature at one seance, the carotid being tied first.

In my first case I tied the third part of the right subclavian, and I would prefer to ligate in this region in most cases. In my second case, because I made my incision expecting to tie the innominate, I tied the first part of the subclavian. This I think was a mistake and unnecessarily endangered the limb. After tying the carotid I should have exposed the subclavian in the third part of its course and applied the ligature there.

Barwell wisely insists that serious disease of the aortic valves, serious mitral disease, or decided cardiac hypertrophy are contraindications to double distal ligation, although slighter conditions of cardiac disease may not absolutely contraindicate the ligation of one vessel. Later it may be possible to tie the other vessel.

Obliteration of the left carotid, shown by absence of the carotid pulse, the facial pulse, and the temporal pulse, absolutely contraindicates ligation of the right carotid, but, as Barwell says, does not absolutely contraindicate ligation of the third part of the right subclavian, that is, does not if there is a radial pulse in the corresponding arm (Matas in Keen's Surgery, vol. v).

Aneurysm of the aorta is usually regarded as a contraindication to operation. In cases of innominate aneurysm with aortic involvement, operation

Photograph of the patient (case 2) after the operation.

certainly gives very poor results. But we must remember that Guinard ties the carotid and subclavian on the right side for certain cases of aortic aneurysm, and that Holmes has protested against refusing operation because aortic aneurysm exists. Barwell would operate if the aortic disease is sacculated, if it is limited to the aortic arch, and if it does not involve the transverse portion. He would not operate if there were fusiform dilatation of the aorta (Ashhurst's International Encyclopædia of Surgery).

There is no doubt that a large innominate aneurysm gives a worse prognosis than a small one, that operation is less likely to succeed in a fusiform than in a sacculated aneurysm, and that a recent aneurysm is more favorable for cure than an old one.

Serious visceral disease of course contraindicates operation.

The entire subject was ably reviewed in 1907 by Imbert and Pons (Archiv. Provincial Chir., t. xvii).

Should I ever have another opportunity to operate for an innominate aneurysm I would be disposed to first partly occlude the common carotid with one of Halsted's aluminum bands. The complete occlusion could be gradually accomplished, and if cerebral symptoms arose the band could be removed. After the occlusion of the carotid it would be decided if in that case it were advisable to occlude the subclavian. Were I to conclude that it was advisable, I would either tie the third part of the subclavian or gradually occlude it with a metal band.

DEPARTMENT OF TECHNIQUE

SOME OBSERVATIONS CONCERNING INTESTINAL ANASTOMOSIS[1]

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SUCCESS in intestinal operations depends upon the following:

1. General condition of patient. 2. Preparation of the patient. 3. Condition of the alimentary canal. 4. Kind and manner of anastomosis.[2] 5. Rapidity and dexterity of operation. 6. Accuracy and care of stitching. 7. Suture material. 8. Number of rows of sutures. 9. Manner of placing the respective rows of material. 10. Surgical cleanliness. 11. Character of growth removed. 12. Amount of tissue and part removed. 13. Healthfulness of tissue left. 14. After treatment.

The condition of the alimentary canal at the time of the operation determines in a measure the success of gastric and intestinal operations.

A patient prepared by limiting the diet to sterile liquids for two or three days previous to such an operation, by a thorough washing of the stomach and the removal of most of the waste products from the alimentary canal, is well fortified against any serious complications.

When the above precautions have been observed the least tension or stress is put upon the sutures and tissues making up the anastomosis.

Ever since it was found that the abdomen could be safely invaded to attack disease, much effort has been put forth to perfect a simple, safe, and satisfactory method of intestinal anastomosis.

Surgeons working for years experimentally and by actual practice with bone plates, bobbins, cylinders of magnesia, the Murphy button, special instruments, etc., have come to the conclusion that the suture method is the most satisfactory.

Many of these appliances were used by their originators with dexterity and much satisfaction. Most of them have been discarded by the skilled surgeon of to-day. The bowel clamps for holding back the bowel contents and steadying the viscus while the work is being done are about the only special appliances now used by surgeons.

The purpose of the sutures is to prevent leakage, pursing, and hæmorrhage, and to hold the loops of intestines in apposition until union has occurred. When such union has taken place, they should be absorbed or passed off into the lumen of the gut.

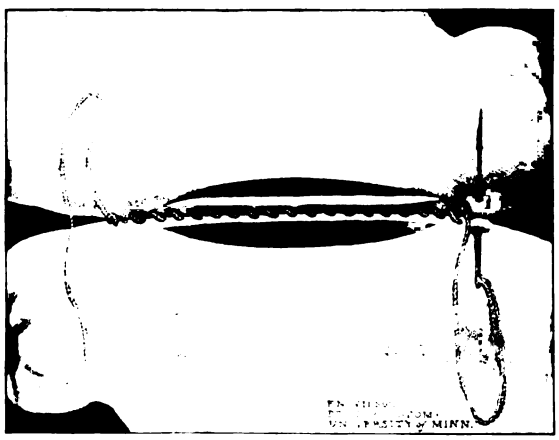

Fig. 1.

Fig. 2.

[1] Read before the Western Surgical and Gynecological Association, Omaha, Nebraska, December 20, 1909.
[2] The word anastomosis has been substituted for the word suture as better fitting the title of this paper.

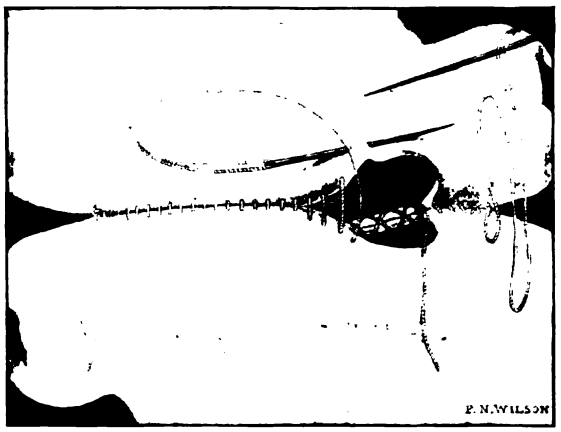

Fig. 3.

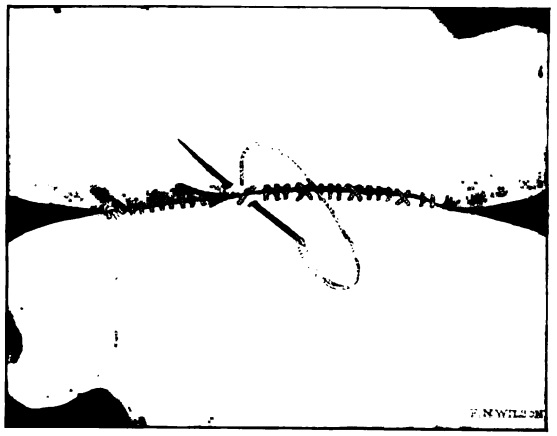

Fig. 4.

There has been much controversy over the method and manner of uniting two loops of intestines. It would seem, however, that few men now would select any but a side anastomosis, where that one is possible, as the blood supply is much better, the anastomosis is more secure and accurate, and it gives a greater percentage of recoveries.

Silk has been used for bowel anastomosis more than any other material, but Pagenstecher thread is now frequently employed and makes a good substitute.

Since we are now able to produce a sterile catgut suture, and one which will last a sufficient length of time for union of the intestines, catgut should receive more consideration.

In several experimental operations upon the lower animals, the author has from time to time demonstrated its advantages and security. In fact the use of chromic catgut for both lines of sutures has been followed by perfect results in every instance when carefully employed.

In practice chromic catgut for appendical work, to turn in gastric ulcers, and to repair small fæcal fistulæ has proved to be a safe suture. In most cases of gastroenterostomy or bowel resection, the Pagenstecher has been used within and the chromic catgut without with satisfactory results.

When non-absorbable sutures are used, they are exposed to the encroachment of the omentum or loops of bowel and numerous adhesions may form, especially if infection occurs.

It frequently happens that where a non-absorbable purse string suture is used for the appendix it causes great distress, many adhesions, lessened bowel activity, obstruction, or abscesses, necessitating further surgical work. In other words the foreign substance acts as a constant irritant, against which the tissues rebel causing no end of trouble at times.

Since the ideal result of an intestinal anastomosis is secured when there is in due time an expulsion of the non-absorbable sutures into the lumen, a method which most facilitates the accomplishment of such a result is to be favored. The nearer the suture line to the lumen of the bowel the more likely does this early sloughing take place. There is not the loss of so much bowel tissue, nor the overproduction of plastic exudate, when the non-absorbable suture is confined to the inner layer.

METHOD OF SUTURING

A suture introduced in the most rapid manner consistent with the security against leakage, hæmorrhage, or infection, to approximate like structures and to maintain the proper sized opening, is desirable. The continuous Lembert stitch is quickly introduced and gives a good appearance to the bowel, but is liable to produce pursing. It may cut out and loosen up the suture line, in case of early bowel tension, thus causing leakage and infection.

The cobbler's stitch makes a very secure and

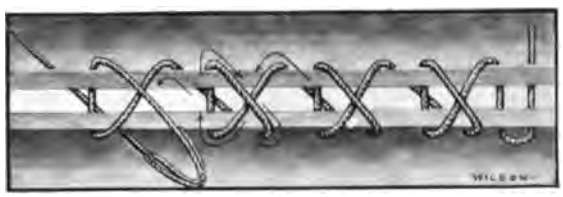

Fig. 5.

Fig. 6. Introduction of first or outside row of chromic catgut sutures.

Fig. 8. Completion of outside catgut suture (Lembert).

safe anastomosis. It does not allow any leakage of gas or bowel contents. It can be tied at short intervals making slipping impossible. On the other hand it is a slow process of suturing. A third assistant is usually required in order to do fairly rapid work. It is a very satisfactory inner stitch uniting the mucous membrane by a through and through stitch and makes the operation safe. It controls hæmorrhage perfectly and sloughs out in the course of two weeks into the bowel. It can be quickly enclosed by a continuous Lembert stitch of chromic catgut.

Cushing's suture purses some and if it pulls out the suture line may open up and permit the escape of infectious material. It is not as quickly introduced, however, as the continuous Lembert. It is very useful in turning in the mucous membrane of the upper side of the inner suture line. If a lock stitch is used in connection with this suture the anastomosis is more secure and perfect.

The interrupted suture is too slow a process and is not more secure or perfect than others. Connell's suture, when an end to end anastomosis is made, is very satisfactory, but slow.

Lembert's continuous suture or Halstead-Lembert is a very satisfactory one in approximating the serosa. It can be locked if deemed wise, by a backward stitch passing through the tissues, which does not allow puckering or slipping.

Fig. 7. Inner suture of Pagenstecher thread, continuous through and through stitch.

The backward lock stitch consists in making an overstitch with a backward stitch between the last two sutures, through the bowel coats, locking each and coming out on the opposite side a little in front of the last forward stitch (Fig. 5). It certainly makes a flawless stitch allowing no leakage or separation of tissue. The whole suture line does not loosen up if one stitch cuts out.

The inner suture line is the important one for the reason that it is completed first and determines the size of the opening between the loops of intestines. It is the one which controls hæmorrhage, and should not permit temporary leakage or infection of the outer suture line. This suture should be a through and through stitch. The backward lock stitch meets these indications and when surrounded by a chromic catgut Lembert suture an ideal result may be expected.

The outer suture or chromic catgut is absorbed and the inner or Pagenstecher's thread in due time sloughs into the bowel, leaving no foreign substance to interfere with the bowel action or to promote adhesions.

TECHNIQUE OF THE OPERATION FOR INTESTINAL RESECTION, AS SELECTED FOR ITS RAPIDITY, SECURITY, EASE, AND ACCURACY, FROM EXPERIMENTS, AND BY ACTUAL PRACTICE

The loops of the intestines desired are brought up through the abdominal wound, the part to be resected is examined. The abdominal opening and parts to be operated upon are carefully surrounded with wet gauze. All bowel contents are carefully pushed back to a safe distance and bowel clamps armed with rubber are placed upon the intestinal loops at a sufficient distance to allow enough bowel tissue to be used for the anastomosis. (In case of a gastroenterostomy long clamps armed with rubber are placed on the stomach for the same purpose.)

Fig. 9. The arrows a, a, show line of union. Chromic catgut No. 1 for outside suture (cobbler's stitch), Pagenstecher's for inside continuous lock stitch. Twenty days between two operations.

The mesenteric vessels supplying the portion to be resected are now ligated with chromic catgut No. 2, 20 day.

Pagenstecher thread is next tied securely around the intestine a safe distance from the diseased portion. No. 1, 20 day chromic catgut as a purse string suture, is placed three-fourths inch below the Pagenstecher ligature.

Clamps are placed on the ends of the diseased segment one-half inch within the ligatures, while other clamps steady the bowel near the constricting suture. The bowel is severed and the exposed mucous membrane carbolized. A blunt pointed artery forceps inverts the stumps and the purse string sutures are tied.

The loops are now brought along side. A chromic catgut suture No. 0, 20 day, on a proper sized straight intestinal needle is now introduced at the operator's end of the anastomosis and a continuous Lembert stitch is rapidly introduced, the needle being grasped each time by a forceps in the hand of a third assistant (Figs. 1 and 6). The loops of intestine are pressed closely together by the first assistant, which makes the introduction of the suture easy and rapid. This suture is continued along the bowel surfaces near the mesenteric border for about three inches.

The loops, well surrounded with fresh moist gauze pads, are now opened close to the suture line with a sharp knife and enlarged by a blunt pointed straight scissors, until the opening is made in either loop about two inches or more in length. The bowel is gently stroked towards the anastomotic opening and the field well cleared. Hot compresses lessen the bleeding somewhat.

An inner suture of Pagenstecher thread is now started first at assistant's end and a continuous back lock stitch is quickly introduced, passing through all the coats near the cut lines (Figs. 2 and 7). It is continued around the anastomotic opening, the angles safely secured by a deeper hold of the tissues. When the opposite side of the through and through stitch line is reached the assistant's thumb and index finger with sponges closely approximate the edges, the suture is so placed as to turn the mucous membrane in by a through and through modified Cushing's suture with the loops appearing on the inner surfaces of the bowel (Fig. 3).[1] When the other angle of the opening is reached it is carefully sutured with a few supplementary sutures and tied to the end left. This stitch is locked at intervals.

The needle threaded with the chromic catgut, by which the first line of approximation was made, is now picked up and the Lembert stitch is continued around the rest of the anastomotic opening, enclosing the inner or Pagenstecher suture line (Fig. 4). The loops of intestines being held by sponges in the assistant's and operator's hands, from their respective sides (Fig. 8). The angles are especially well secured and locked and the suture tied to the long end left at the beginning of the sewing. If any weak or doubtful point remains, the omentum may be stitched here with plain or chromic catgut.

Fig. 10. The arrows a, a, show line of union. Cobbler's stitch of chromic catgut No. 1 outside, lock stitch of same inside. Ten days had elapsed between the first and second operations. X, location of suture.

[1] Drawing does not represent back lock stitch used at intervals, but is placed as represented in Fig. 2.

Fig. 11. X shows where suture passed. Chromic catgut, continuous suture, occasional lock, outside Pagenstecher thread, through and through, lock stitch inside. Twenty-six days from first operation.

A secure and firm suture line is observed to be made. The parts are carefully sponged and cleaned up, the bowel clamps are removed, and the loops placed within the abdomen.

AFTER TREATMENT

The after treatment of these cases I believe to be very important. No food should be allowed for a couple of days. The more sterile the food when given the less chance is there for fermentation, distension, and infection, which may weaken the suture line. Solid food causes more pressure upon the structures. A sufficient time should be allowed after an operation for nature to throw out the plastic exudate which closes all chance of escape of infectious micro-organisms, before the bowel should be called into very active service in propelling the fœcal contents onward.

If there is much distension of the bowel the sutures may strangulate the tissues, or cut out, and so loosen their hold upon the structures. If there are any solid contents passing through the anastomotic opening early, the suture of the inner layer may be dragged out too soon.

CONCLUSIONS

1. The preparation of the patient by carefully selecting the diet, proper attention to waste product elimination, stomach washings, etc., goes a long ways towards bringing success in intestinal operations.

Fig. 12. X shows opening in spec. of anastomosis. Twenty-seven days from operation.

2. Special instruments or buttons for making an intestinal anastomosis have practically all been discarded for the suture.

3. The sutures are to prevent hæmorrhage,

Fig. 13. Direction of arrows marked a, a, indicate line of union. Chromic No. o catgut outside, Pagenstecher thread, back lock stitch inside. Nine days from last operation.

leakage, and to approximate like structure until a firm union has taken place, after which they should be absorbed or passed off into the intestines.

4. The side anastomosis is chosen because of the positive blood supply. It permits of a larger opening and is usually more practical.

5. Pagenstecher's or silk thread when used for the outside suture in bowel work may provoke unnecessary adhesions, calling for further operative procedures, or may cripple the action of the bowel.

6. The linen thread when used for the inner line of suture should be cast off into the lumen of the bowel after terminating its period of usefulness.

7. This inner suture should be so placed as to prevent pursing or narrowing of the anastomotic opening. The through and through back lock stitch is very suitable for this purpose.

8. Chromic catgut makes an admirable suture for the outer layer, and when used as a continuous Lembert outside of the Pagenstecher lock stitch, a safe and satisfactory union occurs.

9. Care should be observed in performing operations to avoid contamination.

10. The after treatment of the case is very important. Food should not be given too early, so as to avoid undue tension upon the suture line.

A NOTE ON SARCOMA OF BONE

By GILBERT BARLING, M. B., F. R. C. S., Birmingham, England
Professor of Surgery in the University of Birmingham; Surgeon to the General Hospital

THERE seems to be a tendency at the present time to take rather a despairing view of the future of patients operated upon for sarcoma of bone. Many of these patients have to submit to severe mutilations, and if the final results are constantly disappointing surgeons may have to reconsider the advice they have been accustomed to give in such cases. A somber picture is given by Dr. Coley in Surgery, Gynecology and Obstetrics for February, 1908, and one quite as gloomy by Dr. de Nancrède in the Annals of Surgery for July, 1909, in a paper which examines the final results of the excision of the scapula for sarcoma. I feel bound, therefore, to record some cases which afford a brighter picture. All of the patients, four in number, were submitted to the interscapulothoracic amputation of Berger, two for sarcoma of the humerus, two for sarcoma of the scapula, and for convenience of record I have added two operated on for sarcoma of the axilla, making six cases in all. The cases seem to me to be worth recording, not only because of the length of time some of the patients have survived, but because they illustrate two or three other important points.

Two have already been recorded in the Clinical Society's Transactions, London, vol. 31, but it is necessary here to give a brief note of each of these, as happily one of the patients is alive and well twelve and one-half years after the amputation.

Case 1. Myeloid sarcoma of the right humerus in a male aged 53. Three and a half years before admission to hospital, when swinging his right arm to strike one of his children, the patient felt something break, although the force used was very slight, and on presenting himself

Fig. 1.

Fig. 2.

at the hospital it was found that there was a fracture of the humerus. The fracture appears to have united, but some time after it was noticed that the arm was beginning to swell, the swelling slowly increased until three months before I saw the patient when the increase became very rapid. The patient had not sought advice after the fracture united because when the swelling arose he feared that if he consulted a surgeon an operation would be recommended. The condition at the time of the operation was that the upper two-thirds of the right arm were occupied by a huge tumor which increased from below upwards, in parts it was tense but firm, on other parts there was evident fluctuation. The growth encroached over the shoulder joint and obscured the outer end of the clavicle and the spine of the scapula, it filled the axilla and stretched under the pectoral muscles. The following were the comparative measurements: vertical measurement round the right axilla, twenty-seven inches, round the left, eighteen inches; girth of the right arm immediately below the axilla twenty-eight inches, of the left arm thirteen inches.

The history of spontaneous fracture, the length of time the growth has existed, its evident cystic condition, and the absence of secondary growths led to a diagnosis of myeloid sarcoma and with great difficulty the parts were removed by Berger's amputation on February 8, 1897. A fairly good recovery followed the operation but within five months it was evident that systemic infection had occurred, the growths were numerous, and the patient died a few months later.

Photograph 1 shows a section of the growth which had implicated the soft tissues up to the skin and had practically destroyed the upper two-thirds of the humerus. The microscope confirmed the view that this was a myeloid sarcoma.

CASE 2. Mixed round and spindle cell sarcoma of the humerus probably periosteal in origin, in a male aged 37.

The patient's history was one of pain in the left upper arm, duration of about seven months and of swelling which had been noticed only for about three months.

On admission to hospital a swelling of the left arm was noted which extended from just above the elbow up to and involved the shoulder joint. The swelling was firm but somewhat elastic, the parts felt infiltrated and the skin was tense. On grasping the limb firmly distinct mobility was detected at the junction of the middle and lower thirds of the humerus.

Interscapulo-thoracic amputation was resorted to February 19, 1897, as it was evident that amputation of the shoulder joint would be followed by speedy recurrence. The patient's recovery was interrupted by an attack of pneumonia but this did not disturb the healing of the wound.

Photograph 2 shows a section through the humerus. The points to be specially noted in the photograph are the extent of the growth, which shows that it had existed for some length of time, and the evident involvement of the capsule of the shoulder joint. Microscopic examination showed that the tumor was a round and spindle cell sarcoma, the round cells predominating.

This patient, I am happy to report, remains well at the present time, that is, twelve and a half years after operation.

CASE 3. Myeloid sarcoma of the scapula fungating through an exploratory incision. A girl, aged 8, was admitted to hospital February 28, 1901, complaining of a large swelling over the right shoulder blade which had first been noticed the previous September, when it was described as being the size of a hen's egg. For some weeks the part was bandaged and the patient was eventually taken to a hospital, where an exploratory incision was made into the growth; she was discharged without further interference and the parents sought advice at the General Hospital because the growth had broken through the skin.

State on admission. There was a large diffuse swelling over the dorsal aspect of the right scapula, it was ulcerated at its apex, the skin was fixed on it, the growth was immovable on the scapula though the scapula itself was movable, the axillary glands were somewhat larger than on the opposite side. A diagnosis of sarcoma of the scapula was made and there being no evidence of secondary growth elsewhere, Berger's amputation was performed on March 4th. The operation was very well borne and a speedy recovery followed.

The tumor proved to be a myeloid sarcoma, endosteal in origin and growing from about the middle of the scapula. The glands were not infected.

The patient remains well at this date, nearly nine years after the operation. She leads a very useful life and is able to do most things that a young woman can undertake, including the knitting of stockings, sewing, and house work.

Fig. 3.

Photograph 3 shows a posterior view of the scapula, growth, and shoulder joint. The opening in the skin through which the growth fungated is also shown and a partial view is seen of the growth projecting from the ventral aspect of the scapula.

CASE 4. Round cell sarcoma of left axilla. Mrs. B., aged 45, had noticed two years previously a lump the size of an egg situated to the outer side of the left breast towards the axilla, six months later she was advised to have this removed, but her husband refused his consent to the operation. The growth progressed steadily in size until the patient's admission to a Nursing Home on March 15, 1905.

State on admission. The left axilla was occupied by a tumor the size of three fists, it pushed under the pectoral muscles on to the front of the chest wall, extended right up to the clavicle and involved the skin which was adherent over an area larger than one's hand. The tumor was firm but elastic, it was tightly tied down by the structures surrounding but appeared to be movable on the chest wall and it was probable that the vessels were free, as there was no œdema of the arm and the absence of pain and paralysis indicated that the nerve trunks were also free. Berger's amputation was performed, the flaps being somewhat modified as the skin over the front of the tumor was rather extensively involved. A speedy and easy convalescence followed, but the patient died exactly a year afterwards with local and general infection.

Examination of the removed parts failed to identify any particular structure as the starting point of the growth.

CASE 5. Round cell sarcoma of the right scapula. A child, aged 10, was admitted to hospital November 30, 1905, with swelling of the right shoulder blade and loss of power in the right arm. The swelling was hard and rather tender, it filled the supra- and partly the infraspinous fossæ so that the spine of the scapula could hardly be defined, the humerus moved without the scapula but the child complained that she was unable to raise the arm more than three or four inches from the side; the extremity was wasted and soft. It was believed that something was wrong with the shoulder as long as twelve months before, as it was painful at times, but about five months before admission to hospital the pain had disappeared. The patient was a feeble, delicate looking child with slight cough and some moist sounds over both lungs, but there were no tubercle bacilli in the expectoration.

An exploratory incision was made and a small piece of growth removed for microscopic examination, it was found to be a round cell sarcoma. As the child was obviously unfit to bear a severe operation at that time she was transferred to the medical side under the care of my colleague,

Fig. 4.

Fig. 5

Dr. Simon, and was sent back to my wards much improved in health on January 8, 1906.

On that date Berger's amputation was performed and was very well borne, the shock being quite slight and a very good recovery followed.

Photograph 4 shows a vertical section through the growth and scapula, it will be seen that the tumor is one of considerable extent, its margins can be pretty well defined from the muscles around and it will be noticed that from the supraspinous fossa the growth extends into the capsule of the shoulder joint. Further investigation confirmed the view that the growth was a round cell sarcoma.

The patient remains well at this date, that is, nearly four years after her operation.

CASE 6. Fibrosarcoma of the axilla (from the first rib). A male, aged 21, was admitted to hospital on April 19, 1909, with a hard nodular swelling occupying the left axilla, the skin was becoming adherent to the surface of the tumor. The swelling occupied the whole of the axilla, it was slightly painful and sometimes the pain shot down the inner side of the left arm; on attempting to extend the arm at a right angle the growth seemed mechanically to fix the part. There was more fixation of the tumor than could be explained by mere tying down under muscles, but it was impossible to come to any certain conclusion whether this was to the rib, and if so, to which, but it was suspected that the fixation was to the second and third ribs.

The history showed that some swelling had been noticed in the axilla for about eighteen months; it increased slowly at first and then much more rapidly.

April 23. An exploratory incision was made by transverse division of the pectoral muscles and a portion of growth was removed for microscopic examination; even with a free opening of the tissues it was not clear where the deeper attachment arose, but it was believed to be from the second rib.

The microscopic report of the removed fragments showed that it was a sarcoma of low grade.

May 3. As soon as the exploratory incision was fairly healed Berger's amputation was performed; here again the skin flaps had to be somewhat modified to suit the exigencies of the case, a short anterior and a long posterior skin flap being devised.

This was by far the most difficult amputation of the kind I have performed, the difficulty being due to the fixation of the growth at its origin, which proved to be eventually from the first rib. The tying of the growth here prevented the scapula and arm being drawn away from the trunk, which is most important to be done at a certain stage of the amputation. The growth at its attachment to the first rib implicated the axillary vein. In freeing the vessel it was torn rather extensively and some air entered the vein, but happily not in sufficient quantity to cause any dangerous symptoms. With very great difficulty the vein was secured beyond the point of tearing, but this untoward event prevented me from doing what I had originally intended, namely, resecting the portion of rib from which the growth proceeded. Had the point of origin been from the second or third ribs this would have been quite feasible and indeed called for, but the relation of the first rib to the vein, and the trouble already experienced in dealing with the latter deterred me from anything more radical than a thorough cauterizing, with a Paquelin's cautery, of that portion of the rib to which the growth had been attached.

An easy convalescence ensued and so far there is not the least evidence of re-growth in the scar. Injections of Coley's fluid were given for about a fortnight after the operation but the patient then refused to continue these, although the dosage was carefully regulated so as to cause a minimum of constitutional disturbance and local discomfort.

Berger's method of amputation has steadily advanced in the favor of English surgeons, my colleague, Sir Thomas Chavasse, having been one of its earliest advocates. In my opinion it gives much better final results in many cases of sarcoma of the scapula and sarcoma of the humerus than can be attained by mere excision of the bone in the first mentioned condition, or amputation of the limb in the other. These more limited operations often invite local recurrence from the small margin of healthy tissue left after the disease has been removed, and there is instructive reading provided in Nancrède's statistics, already alluded to, for there appear to have been fifteen cases with local recurrence in sixty-five operations for excision of the scapula, and if the records were more complete it is probable that other than these fifteen patients would have been found to have suffered from local return of the disease. The risk attached to the larger procedure is very little greater than that which follows excision of scapula or amputation at the shoulder joint. I find that my surgical colleagues in Birmingham and myself have alto-

gether performed nineteen interscapulo-thoracic amputations for growth without a death, and two amputations of this kind have also been performed for traumatism, with one death from shock and sepsis, due to the nature of the injury rather than to the method of operation.

I have not had an opportunity of discovering the final results in all these cases and so present only my own with a few comments. The first patient died with rapid and wide-spread generalization from a myeloid sarcoma which had existed probably for at least four years, as he had suffered a spontaneous fracture of the limb three and one-half years before the amputation. This suggests that however mildly malignant a myeloid sarcoma may be in its earlier stages, the benign character does not persist when the growth has extended widely from its origin into tissues such as muscle and subcutaneous fat, where the myeloid cell is entirely a foreign element.

Case 3 was not diagnosed as a myeloid growth until after amputation had been effected. Had I known the exact nature of the tumor, in the presence of fungation, I should still have hesitated to resort to mere excision of the scapula. That I am conservative in the treatment of myeloid sarcoma at an early stage of its existence may be illustrated by a case which I propose now briefly to describe and illustrate.

D. S., male, aged 14, was admitted to the General Hospital December 1, 1906, with sudden inability to use his right arm. A fortnight before his admission the patient was at work and saw a piece of machinery falling and raised his right arm suddenly as though to ward it off, although he was actually some distance from the machine and could not possibly have been touched by it. As he raised the arm he felt something crack and the limb became useless. The patient was examined and though no distinct crepitus could be felt it was doubtful whether there was not egg shell crackling, and in the face of the doubt a radiograph was taken.

Photograph 5 shows at the upper end of the humerus a general expansion of the head and the adjacent part of the shaft, with a fracture at the outer side of the bone as though some of the surface layers were splitting off, and growth can be traced down the bone for nearly three inches.

The muscles of the right arm were well developed, sufficiently to greatly obscure the swelling of the bone which could hardly be recognized with certainty. The history of spontaneous fracture together with the radiographic picture suggested that the growth was a central one of the humerus, probably myeloid in nature, and seeing that the growth was of such recent development it was decided to perform a very limited operation.

Operation. An incision was made over the front of the joint which fell practically on the interval between the deltoid and pectoralis major, the capsule of the joint was opened and freely cut away, and the bone was divided about three-quarters of an inch below the lower limit of the new formation. The long tendon of the biceps was freely dealt with.

A speedy healing followed and the patient was discharged from the hospital merely with a spica bandage and a pad over the shoulder to give support. He has continued to wear a pad and bandage and in this way he is able to made considerable use of the arm, though if the bandage is taken off, his power of movement is not nearly as good.

The growth, as was expected, proved to be a myeloid sarcoma and the patient remains well at the present time, three years after his operation.

A NEW OPERATION FOR PROMINENT EARS BASED ON THE ANATOMY OF THE DEFORMITY

By W. H. LUCKETT, M. D., New York City, New York

PROMINENT ears are comparatively of uncommon occurrence. It is not sufficient to tell a mother of a child that repeatedly returns home from school crying because he has been called "donkey ears" or "sail ears," to leave him alone for such advice will not be accepted, and the odium attached to these ears and the constant harassing by his class-mates frequently is the cause of so much distress as to produce a very bad mental condition in the child as well as in the parents, and to warrant our surgical interference. This deformity occurs in either one or both auricles and in either the whole of the auricle or the lower or the upper part.

Recent writers upon this subject and articles in text-books ignore entirely the anatomy of the deformity, and for that reason describe operations that may temporarily change the so-called cephaloauricular angle, but will be followed by neither a permanent result nor by a restoration of the normal anatomy of the ear. In order to understand the operation herein described it is necessary for us to enter into the anatomy of the auricle or pinna to a certain extent.

To a careful observer "donkey ears," or prominent ears, means something more than an increase in the cephaloauricular angle as suggested in recent text-books on surgery; it means a deformity

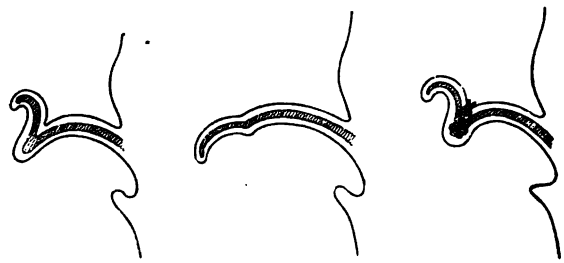

Fig. 1. Fig. 2. Fig. 5.

Fig. 1. Schematic horizontal section of a normal auricle just above the level of the auditory canal.

Fig. 2. Schematic horizontal section of a prominent ear, showing absence of the fold in the cartilage that forms the antihelix.

Fig. 5. Schematic section of auricle after completion of the operation; sutures in cartilage and skin of reconstructed antihelix.

of the ear itself, a change in its topographical anatomy. Rarely have I observed a perfect ear, anatomically, set at so great an angle from the head as to attract attention.

The external surface of the normal auricle is irregularly concave, and presents for examination several well marked depressions and elevations which depend for the most part upon the same depressions and elevations in the underlying cartilage. The concha, the largest and the deepest of the concavities, surrounds the entrance or meatus to the external canal. This funnel-like fossa is subdivided by an obliquely transverse ridge, the crus helicis, which runs forwards and upwards curving backwards and downwards along the curved margin of the auricle forming the helix and terminates just above the posterior margin of the lobule in the cauda helicis. The second elevation, the antihelix, which is in front and parallel to the helix, is a curved ridge which begins at the antitragus below, forms the concave posterior boundary of the concha and divides above it into the superior and the inferior crus between which lies the fossa triangularis or fossa antihelix. A horizontal section through the auricle just above the level of the auditory canal shows that the cartilage of the concha bends outwards at a right angle from the head until it reaches the antihelix, which it forms by being folded backwards upon itself. Fig. 1.

Now in most prominent ears which are characterized by a bending forwards of the auricle, either the antihelix is undeveloped or entirely absent, the concavity of the concha being continuous with the concavity or fossa of the helix. Fig. 2. In those cases of prominent ears characterized by a drooping of the upper part of the auricle we have the concavity of the concha continuous with the fossa triangularis and the fossa helicis, both intervening ridges of the crura antihelicis being absent or in some lesser deformities of the upper part of the ear only the upper ridge of the crura antihelicis may be absent. These ridges, the antihelix and the crura antihelicis are simply a fluting, bending, or folding of the cartilage, and are apparently intended as trusses for supporting the flexible ear.

The operation as described and illustrated here is for the purpose of reconstructing the fold or truss of the cartilage recognized as the antihelix in ears turned forwards, and the same principle is applicable for the reconstruction of the superior crux of the antihelix for the so-called drooping ears, or of both together when necessary.

Because the integument is more freely movable, and the sutures more easily passed, and the resulting cicatrix practically invisible the inner or posterior surface of the auricle is chosen for the operation. A crescentic incision is made through the integument opposite to the line of the intended new or reconstructed antihelix. The inscribed integument is removed; the edges of the skin are now dissected free from the cartilage and retracted. Fig. 3. A similar crescentic segment is removed from the cartilage, care being exercised in incising and excising the cartilage not to buttonhole the skin on the external surface of the auricle. The skin and the cartilage are now sutured separately, and it is the method of suturing the cartilage that is emphasized.

The cartilage suture is passed from the cranial side from within out and back again, Fig. 3, care being taken not to perforate the skin on the external surface, then crossed over the excised portion and passed on the other side from within out and back again as a Lembert suture. in such a manner that when the suture is drawn tight and tied, not the edges but the sides or flat surfaces of the cartilage will be in apposition. Figs. 4 and 5. The edges have been turned forwards or outwards to form the antihelix and at the same time the helix is set closer to the cranium thus diminishing the cephaloauricular angle.

Four or five interrupted sutures are usually enough for the cartilage. A so-called fistula, one half circle needle is best for the cartilage. The skin is sutured with horsehair and leaves a very small cicatrix.

The greatest care must be exercised in asepsis as the slightest infection may set up a perichondritis and an auricular perichondritis usually results in a deformed, thickened, corrugated ear. Also care must be taken in the hæmostasis. There are

Fig. 3. Showing removed section of cartilage, retracted skin, and method of passing sutures on the inner or posterior surface of the ear.

Fig. 4. Showing folding of cartilage after sutures are drawn tight and tied.

no large vessels encountered, and usually the continuous pressure of the artery clamp during the operation is sufficient. It is well to avoid ligatures, but when they must be used only the finest and a single tie is sufficient. A hæmatoma auris is quite deforming.

The width of the crescentic segment of the cartilage to be removed depends upon the size of the ear, and the thickness of the cartilage. In macrotia a large section is removed. In microtia a small section or no section at all is removed, only an incision is made to facilitate the turning outwards of the edges of the cartilage.

In an ear with a very thin flexible cartilage I think it would be possible to reconstruct the antihelix and set the helix close to the head without excising a segment or even incising the cartilage, simply by fluting or folding the cartilage at the proper site, and passing the suture in such a manner as to maintain the fold.

ANOMALOUS KIDNEY (NEPHRECTOMY)

By BENJAMIN MERRILL RICKETTS, M. D., Cincinnati, Ohio

THE accompanying illustration is of the left kidney, removed from a female, about thirty-five years old, for pus in the urine and the symptoms usually associated with pyonephrosis.

Two operations, the first a nephropexy, and the second a nephrotomy, were done by a competent surgeon, about six and ten months respectively, before I made the nephrectomy. Being much in doubt as to the presence and character of the two kidneys, a median incision was first made through the anterior belly wall. The right kidney was found normal in size and position, while the left kidney could not be felt through the dense mass of adhesions. A posterior incision was made extending down upon the firmly fixed kidney With my left hand within the peritoneal cavity, pressing firmly upon the mass and my right fingers separating the kidney from the adhesions posteriorally, it was with great difficulty delivered posteriorally and removed. Provisionary drainage was continued about five weeks, with recovery uneventful.

Remarks. The kidney was about one-third the size of its mate, irregular in shape, devoid of a renal artery and vein, and about ninety per cent or all of its function.

It was an anomalous kidney, probably having never functionated but slightly if at all. Small

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vessels can be seen here and there, giving evidence that the kidney was nourished by vessels by the mass of adhesions. There is every evidence that the absence of the main vessels is due to embryological and not surgical defects.

While the kidney was abnormal in shape, there is a possibility of its having had a renal artery and vein before the first or even the second operation, and that the degree of infection was much greater, but this is hardly probable. Its vitality was low, but infection never present until after nephropexy. The nephropexy caused continued lessening of vitality which resulted in infection. The true condition probably could not have been detected at the first operation, but pus was removed from the kidney at the second operation.

If the true condition could have been known at the time of the first operation the kidney should have been removed. Pus being found at the time of the second operation should have at least caused hesitation in permitting the kidney to remain.

So far as can be determined the right kidney is normal. The case is reported because of its unique character.

A CASE OF VENEREAL PAPILLOMATA

By H. A. MOFFAT, F. R. C. S., Cape Town, South Africa

THE accompanying photograph does not require much explanation. The patient was a colored man of about twenty-one years; he had had gonorrhœa about two years previously and had no treatment. He came to the hospital in the condition depicted. History was vague. There was no urethritis and no signs of syphilis. Completely encircling the anus was a huge soft papillomatous growth the size of an average head. The attachment was to the skin round the anus for about two inches from the muco-cutaneous junction. The scrotum was free; there were large warty growths on the prepuce. The motions came through the center of the large mass. The glands in both groins were large. His general condition was good, and I could find nothing else wrong with him.

An attempt to remove it with the knife failed; bleeding from large, thin-walled vessels was so profuse and difficult to control that I had to put him back to bed with half a dozen clamps on the incision and the tumor not removed.

Ten days later with the electro-cautery it was easy to remove with but trifling loss of blood.

My accumulators failed when half the tumor was removed, and I had to complete it a week later. He was skin-grafted subsequently, and went out without his encumbrances, and quite well.

A USEFUL STITCH FOR OVERLAPPING FASCIA IN THE CLOSURE OF ABDOMINAL WOUNDS

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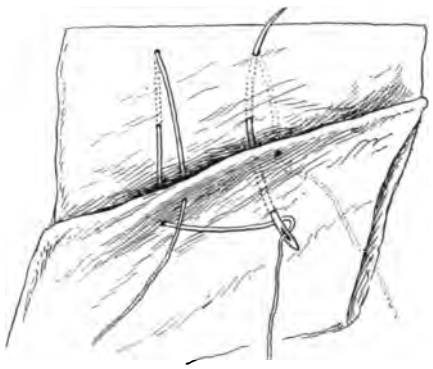
THE advantages of closing abdominal wounds by the layer method with tier sutures is too well-known to need comment. One of the superiorities of this method of closure is the facilities it offers for the overlapping of fascia. The



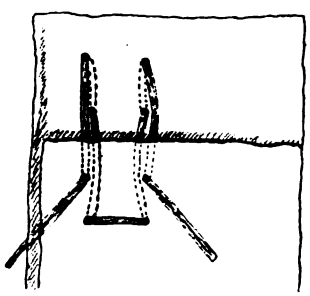
No. 1. This shows the stitch nearly completed. By using a long needle and passing it through and through the stitch may be inserted very rapidly.

above illustration shows a stitch which is particularly adapted for this purpose.

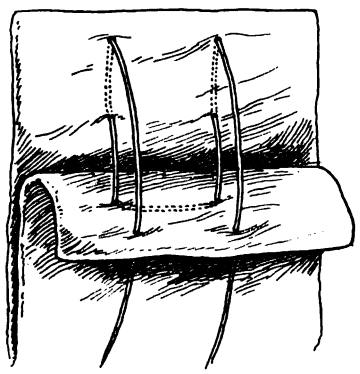
The points in favor of this stitch are: 1. It positively overlaps the fascia. 2. It does not constrict tissue and thus interfere with union. The stitch is a quadrilateral one and no matter how tightly it is tied two borders of the quadrangle are unconstricted. 3. A comparatively large area of fascia is brought into apposition and this not only produces firm union but lessens the number of stitches required. 4. As a moderate amount of fascia is taken up with each passage of the needle, and as the stitch is as it were a double one, tearing out is extremely unlikely. 5. By passing the needle through both fasciæ at once, as shown in Fig. 1, the stitch may be inserted with great rapidity. When the stitch is tied it should form a square, each side of which measures about one-fourth of an inch.

In the lower abdomen in the median line, the deep layers of the superficial fascia are supplied by the superficial epigastric and the superficial circumflex iliac, chiefly by the former, while the rectus and its sheath receive their blood supply from the deep epigastric, which anatomoses into the internal mammary. The branches from all these vessels are quite tortuous, but may be said to have a general obliquely upward direction; in other words, the blood supply of the fascia of the rectus comes from various directions and is with this stitch interfered with to a very small extent.

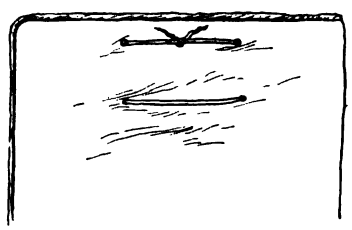
In closing abdominal wounds with tied sutures it is important that the stitches should not be tied too tightly, good approximation is all that is required; tight tying does not add to the strength and by producing puckering will lessen the neatness of the closure.



No. 2. This shows the stitch in place. By tightening the suture preparatory to tying the overlapping will be accomplished.



No. 3. This shows the stitch in place. For purposes of demonstration the overlapping fascia has been turned back.



No. 4. Shows the stitch tied. Note that the stitch has not been tied so tightly as to cause puckering.

THE TUBERCULIN BLISTER REACTION

By HERBERT DE CARLE WOODCOCK, M. R. C. S., L. R. C. P., D. P. H.
Honorary Consulting Physician to the Armley Sanitorium, Leeds, England

I WAS captivated by the simplicity and efficacy of the Calmette conjunctival reaction for tuberculosis. It was French and brilliant. Moreover, it was backed by the name of a great scientist.

But among 600 applications I met with two very serious results, and my first halt was called when a morose patient suggested pecuniary compensation for suffering and loss of work. I was tempted, however, to continue the test, on account of its great convenience, especially as my severe reactions had so far been confined to adults and in them to cases of tuberculosis of the bones and glands.

Lately I have not only relinquished the use, but almost buried the memory of the Calmette test. I was helped to this attitude by a case I saw in the practice of a medical colleague.

The patient in question, twelve hours after the application of Calmette, was prostrated with a severe conjunctivitis, extending in one part to an episcleritis, which prevented his leaving his house for a week; during the second week the control eye became inflamed. Three months elapsed before he was well. Mr. Teale, the eye surgeon, saw him in consultation and photographed the condition. The representations are here given and depict the condition of the eyes three weeks after the application of the "Calmette."

For a little short of three years I had been using the blister reaction for my hospital patients. In private practice I had preferred the more ready conjunctival reaction until the experience above mentioned. I have limited myself since then to the blister reaction in all cases.

I produce two circular denuded surfaces on the skin of the chest, one on each side of the skin of the sternum. In effect I transfer my patient's conjunctiva to his chest wall.

This is the method:

I cleanse the skin with ether and apply two similar blister plasters, each about one-third of an inch broad by one-half an inch long to the chest wall.

The blister plasters are left on for eight hours, the raised epidermal surfaces are then clipped off. The denuded surface is next treated with water dressing for a few hours, or at once washed with ether and carefully dried with a sterilized swab.

To one of the denuded surfaces I apply a piece of sterilized oiled silk, on the under surface of which is one drop of Koch's O. T. undiluted.

I speak of one drop, but 1 cc. of Koch's O. T. will suffice for thirty reactions.

The upper surface of the oiled silk is then *gently rubbed for half a minute*, and by this means the

Photograph showing condition of both eyes three weeks after application of Calmette to left eye.

tuberculin is pressed onto and into the raw surface below. The oiled silk is not removed until the following day. The control blister is treated in exactly the same way, save that no tuberculin is applied to the oiled silk.

In from 12 to 36 hours the raw surface to which the tuberculin has been applied is rosy red and possibly covered with a thin layer of pus; the margin is surrounded by an erythematous halo.

The control blister shows, by comparison, an envious pallor; there is no halo.

In some cases the tuberculin reaction is excessive but no harm is done, the skin is being dealt with, not the conjunctiva.

There is never any doubt about the reaction; if the test is positive it is emphatically positive.

For weeks after, the skin around the positive "blister" is abnormally sensitive; the slightest pressure and it blushes. Yet the denuded surfaces both heal within a few days. Although I have used the test more than 500 times I have not found scrofulous changes about the skin lesions or any of the other troubles which users of the Von Pirquet scratch reaction occasionally bewail. Pustules are seldom seen around the blister.

The deeper layers of the skin are not reached. I have in a few cases found a second blister test to be positive when the first has been negative. I do not attach anything like the value to the second reaction that I do to a first; cases in point have not been clinically tuberculous.

The advantages of this reaction are:

The blistered surface allows rapid absorption.

The reaction is vivid (and I may add it fades slowly).

The raised epidermal surface carries with it surface bacteria; the two "blisters" being similar in size and presumably in activity give similar (i. e. as to depth and extent) surfaces.

The "blister" removes the drier, scaly, greasy, or atrophic layer of skin; it opens up the absorbents without penetrating into the deeper skin layers.

It is remarkable, but nevertheless true, that the control "blister" never shows any surrounding inflammatory erythema if the skin is well cleansed before the application.

The reaction in some cases appears to accentuate the signs of any local pulmonary or other local tuberculous lesion.

The reaction may be expected if the patient is tuberculous and not in extremis.

It has been said that the very showiness of the reaction indicates an unnecessary absorption of tuberculin, and I have seen one evil resulting from this, namely, that a person having previously been tested with Calmette and having reacted positively has been apt to have a return of the conjunctivitis when my blister test has been applied to the chest wall. On the occasion of my showing fourteen blister tests at the Leeds Infirmary, two of the patients exhibited conjunctivitis from this cause. Without stopping to theorize on this fact, I may add that the absorption of tuberculin from a blistered surface is of therapeutic value. I have seen patients improve, especially in weight after the application of one drop of O. T. to a blistered surface. Surely, I have said, this improvement is not due to "suggestion." Wishing to get an authoritative opinion on this point I wrote to Dr. Philip of Edinburgh. He replied that he had already thought of some such therapeutic measure and he advised a continuance of the investigations. Since this communication I have blistered my cases of lupus, and applied the tuberculin. The reaction is excessive, greater than when tuberculin is applied without the preface of a blister. The benefit is commensurate with the reaction.

Thousands of patients have been treated with hypodermic injections of tuberculin; only a few have been treated by the application of tuberculin to a blistered surface. It is impossible, therefore, to compare. But the subject is to me fascinating, possibly too fascinating. I commend it, therefore, to others, who doubtless will approach it in a more critical spirit.

A CASE OF PUERPERAL BACTEREMIA TREATED BY THE INTRAVENOUS INJECTION OF MAGNESIA SULPHATE

By R. R. HUGGINS, M. D., Pittsburg, Pennsylvania

FOR some months the writer has been using magnesia sulphate in the treatment of puerperal infections.

A series of experiments both in animals and in the human have demonstrated that the administration intravenously of this salt is safe and that it is a valuable therapeutic agent in the treatment of infection when given in this manner.

When indicated, the above treatment is supplemented by a continuous intrauterine irrigation of a solution of magnesia sulphate. A full report of the study, dosage, methods, etc., will appear later.

So far as the knowledge of the writer goes this is the first report of the intravenous use of magnesia sulphate.

The case here reported was selected because it was unusually severe. Also it presented the interesting complication of involvement of the iliac glands during the stage of convalescence.

Name, Mrs. G; F. H., negative; P. M. H., health has always been normal.

Menstrual history: Began at the age of thirteen. Has always been regular. Periods of duration from three to four days. No pain, and flow normal in amount.

Pregnancies: First pregnancy occurred 18 months previous to admission to hospital. Nothing unusual during the pregnancy, and delivery was a normal one. Two weeks ago an abortion occurred at about the second month.

Patient admitted to hospital December 8, 1909. She gave a history of fever, sweats, and chills covering a period of ten days. Patient presents an appearance of extreme anæmia, hæmoglobin of 45. Lungs and heart normal. Liver and spleen negative. There is no tenderness over the abdomen. Patient complains of no pain in the pelvic organs. Pulse rapid, and general appearance of the patient is one commonly seen in the presence of profound sepsis.

SPECIAL NOTE

Muco-purulent discharge from vagina. Laceration of the perineum, cervix is enlarged and lacerated on the left side. Body of the uterus slightly enlarged and retroverted. There is no thickening or infiltration in or about the adnexa. On the left side of the uterus there is a small mass extending from the uterus into the perimetrium. Its upper border is on the level with the superior border of the broad ligament, and its lower border on the level with the internal cervical opening. It is about two cm. in thickness, extends to the outer wall of the pelvis, and suggests the extension of the infection directly through the pelvis, via the lymphatics. There is very little tenderness, and careful examination reveals no evidence of any pus formation. The blood culture taken shows streptococcus in pure culture at the end of 48 hours. Diagnosis, puerperal bacteremia.

December 10, 1909. Forty-eight hours after admission patient was given magnesium sulphate (grains 25) in 500 cc. of normal salt solution intravenously. Solution was allowed to run into the vein slowly during the course of about forty-five minutes. Temperature since admission had varied between 102 and 104.6; pulse from 115 to 120. Her physician states that previous to admission to the hospital the pulse and temperature had been running at this rate for about one week, accompanied by frequent chills and sweats. Following the administration of the magnesium sulphate temperature rose to 104 and then fell to 97, where it remained for about six hours, again rising on the evening of the day following to 104. The pulse somewhat lower and improved in quality.

December 13, 1909. Twenty-five grains of magnesium sulphate in 500 cc. of salt solution was administered intravenously, followed by a rising temperature, and again a fall to 98. From this time there was a gradual improvement in the condition of the patient in every way, temperature reaching 99 on the 16th, eight days after admission to the hospital.

December 25, 1909. Patient began to complain of pain in the left leg. On examination, the limb was found œdematous and the saphenous vein could be felt as a tender firm cord ascending to the femoral opening.

December 29, 1909. Patient still complains of great pain in left leg. Greatest point of tenderness is over the saphenous opening, from the lower border to Poupart's ligament. Pulse and temperature elevated.

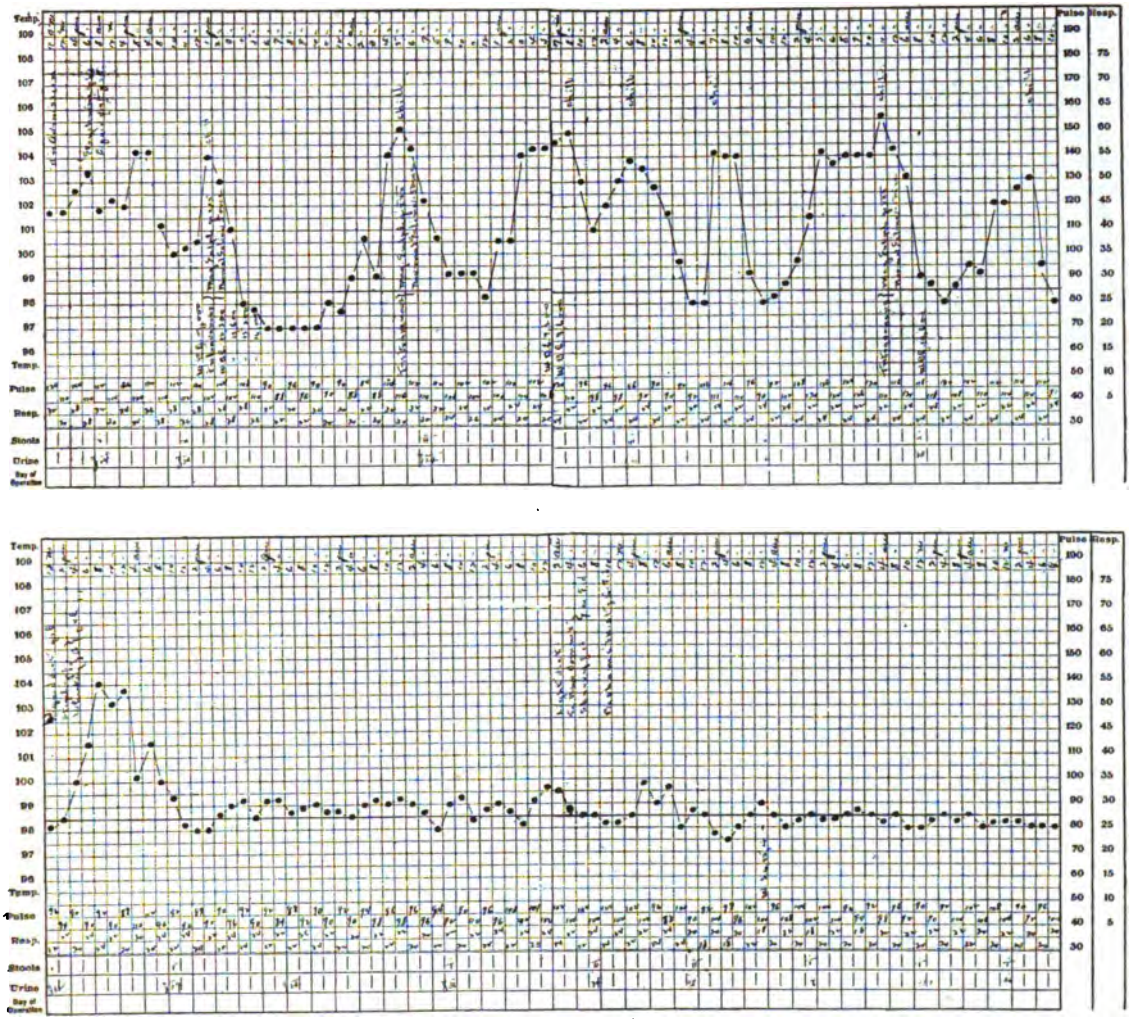
January 6, 1910. For the last ten days patient's temperature has been elevated to 102 or above Swelling at the upper end of left thigh has remained approximately the same. Thigh is fully twice the normal size. There is great tenderness on pressure about the swelling, which extends about one-third the distance to the knee. There is no tenderness in the abdomen; no nausea; no fever.

January 7, 1910. Dr. Miller made an incision about seven cm. long below the left trochanter. The fascia lata was divided, and the whole explored with the finger. No pus obtained. Tissues felt indurated, œdematous, and considerable quantity of blood and serum were evacuated. Cigarette drainage.

January 10, 1910. Patient has been greatly relieved since the operation. Drains removed. There was considerable reddish serous discharge from the wound. Patient continued to improve, and convalescency firmly established. The wound continued to heal nicely.

January 27, 1910. Patient's temperature began to rise, and she complained of considerable pain in the left lower quadrant of the abdomen, the point of greatest tenderness being immediately above Poupart's ligament, extending upward, and apparently located behind the peritoneum, along the course of the deep vessels. This continued without any improvement. Bimanual examination showed no involvement of the tube or ovary on this side, but there was apparent thickness posteriorly, and a diagnosis of involvement of the iliac glands was made.

February 28, 1910. An incision was made parallel to and about 3 cm. above Poupart's ligament. The abdominal wall was divided, muscles, and fascia in direction of the fibers down to the peritoneum, which was pushed



The above charts show the temperature for fifteen days after admission to the hospital. At the end of this time blood cultures showed the absence of streptococci in the blood stream.

aside. Iliac glands were found enlarged, extending upward along iliac vessels as far as the finger could be carried. A regular chain of elastic-feeling glands. These were removed. No definite abscess was found. The wound was partially closed with silkworm gut and drained. Since this time the patient has made an uninterrupted recovery. Temperature and pulse remain normal. Discharged from the hospital March 25, 1910.

TRANSACTIONS OF SOCIETIES

AMERICAN SURGICAL ASSOCIATION

TWENTY-EIGHTH ANNUAL MEETING HELD AT WASHINGTON, D. C., MAY 3, 4, AND 5, 1910

OPERATIONS ON THE HYPOPHYSIS

PROFESSOR FREIHERR VON EISELSBERG, of Vienna, Austria (Abstract from the original paper by Carl Beck, M. D.): Even the smallest of the ductless glands like the parathyroid and hypophysis have important physiological functions. It is known that the total extirpation of the latter is fatal to the animal. The removal of the anterior part seems to affect the animal differently than the destruction of the posterior portion. Clinically the experiences have shown two more or less distinct types in pathological changes of the hypophysis; one characterized by the well known picture of acromegaly, while the other could be described as adiposegenital degeneration. It is essentially a complex of symptoms; headaches, vomiting, epileptic seizures, changes of the optic nerve, maldevelopment of mammæ in woman and hypertrophy of the same in men, abnormalities of pair development, drowsiness, etc. Pathologically the changes have been found to be carcinoma and sarcoma, in many instances only cysts.

After anatomical and experimental studies by Löwe and König, Schloffer of Insbruck operated upon the first case on the continent in March, 1907. Prof. von Eiselsberg operated upon his first case four months later and his second in December, 1907. Since that time a number of cases by Eiselsberg and several operators in America, among them Cushing, Halstead, Mixter, Kanavel, and others, have been published.

Eiselsberg's cases are divided into three groups:

1. Three cases of hypopituitarism, a clinical picture as described above; all cured.
2. Two cases of acromegaly; both died.
3. One case of combination of both; improved materially.

The detail of the histories of the cases showed that the diagnosis in most instances was clear and pointed directly to pathological changes of the hypophysis, besides the characteristic skiagraph showed the destruction of the sella turcica.

The result of the operations was in the cases which survived the operation, a partial or total disappearance of the symptoms, notwithstanding the fact that not all the pathologically changed tissue was removed by the operation. This led Eiselsberg to believe that the pressure upon the normal structures was the cause of the symptoms, hence the removal of only a part of the tumor is followed by relief or apparent cure.

As to the technique, Eiselsberg prefers the nasal route. He is well aware of its difficulties and disadvantages, the necessity of approaching an aseptic and highly sensitive area through an absolutely contaminated field and the depth of the operative field, but he considers the intracranial method still more dangerous. He is inclined to believe that gradually he will be able to dispense with the temporary resection of the nasal skeleton and that he will be able to enter the affected region without external incision through the mouth, though it remains to be seen whether this be a decided advantage, since it may not give such an easy access to the field of operation. Hirsch of Vienna removes the contents of the nasal cavity in several sittings as a preliminary action, and the same method seems to have been followed by West.

From what Eiselsberg has seen in Cushing's clinic, he was very favorably impressed by the intrabuccal route, similar to the method of Kanavel and Halstead, and he will give it a trial, though in his last cases the temporary resection has not resulted in any bad deformity.

One plea is to be made as in all such conditions, and that is the plea for early diagnosis which will bring these cases to the surgeon early enough to prevent the lamentable cachexia of these patients afflicted with the disease of the pituitary body.

Prof. von Eiselsberg closed his highly interesting and valuable report before the Congress of Surgeons in Washington with the expression of his satisfaction with the progress of American surgery and institutions, and with the inspiring words: "I believe that the personal exchange of views and ideas of men of foreign lands and nations not only cultivates science but personal and lasting friendship among the men, and that these ties bring the civilized nations into closer harmony and are in-

strumental in the development of the universal peace among the same."

TECHNIQUE OF OPERATION FOR REMOVAL OF TUMOR OF THE HYPOPHYSIS

DR. A. E. HALSTEAD, of Chicago, read a paper with this title. (See SURGERY, GYNECOLOGY AND OBSTETRICS, May, 1910.)

DISCUSSION

DR. S. J. MIXTER, of Boston: I wish to present a case operated on by the route suggested by Dr. Kanavel. There was a large cyst in the hypophysis filled with cholesterin and holding about one and a half to two ounces of fluid. Patient made a good recovery after the operation and his vision, which before was extremely poor, has been much benefited.

DR. HARVEY CUSHING, of Baltimore: The various means of approach to the hypophysis do not make so much difference as does the matter of dealing with the structure when it is brought into view. The growth often becomes malignant, as is true of long standing trouble with the thyroid, and it is conceivable that it cannot be entirely removed. In fatal cases it has often been found that only a mere fragment of the growth has been taken away. The operation in the first place has for its object the relief of pressure; these symptoms can be combated by the mere removal of the lower part of the sella turcica and the splitting of the capsule of the gland. Whether many of these adenomas are merely hypertrophies of the gland comparable to various diseased changes in the thyroid we do not know, but if so partial removal is indicated.

DR. ALLEN B. KANAVEL, of Chicago: Concerning the technical procedure in Dr. Halstead's cases, in the first one particularly the view could not have been better. The operation was very quickly done, the anterior wall of the sphenoidal sinus quickly removed, and the bulging sella turcica opened, and a tumor protruding into the sinus was removed without difficulty. In the second case the sella turcica did not bulge into the sinus, it was seen with more difficulty and was arrived at by anatomical deductions. In two cases there was considerable hæmorrhage and I would suggest the elevation of the head during the operation. In the majority of cases it will only be necessary within the nose, to remove the vomer and the anterior portion of the sphenoid in order to come down on the sella turcica.

DR. DEAN LEWIS, of Chicago: The tissue removed from the first case contains no elements which are ordinarily found in the anterior lobe or the pars intermedia. The tumor is composed of stratified epithelium with a papillary arrangement. The lower cells rest upon the stroma of the papillæ and are cylindrical, while the cells of the succeeding layers differ in shape; the differences apparently being due to variations in pressure. As the cells of the anterior lobe and the pars intermedia are not reproduced in this growth, we must assume that the tumor has probably developed from an epithelial inclusion, which has not gone on to complete differentiation. The growth corresponds histologically to a group of tumors which occur about the infundibulum and extend down to the sella and up to the third ventricle.

The tissue removed from a second case came from the anterior lobe. In some sections the cell columns are cut parallel, long rows of cells resting between rather thick connective tissue trabeculæ. In other fields the cell columns are larger than normal; the connective tissue between the different columns having broken down, thus permitting of fusion. In still other fields the fusion has become so marked that large groups of cells are found, hyperplasia apparently having ended in adenoma formation. Karyokinetic figures may be seen in a number of different fields.

It is important to recognize the complex structure of the hypophysis in making the anatomic diagnosis of tumors of this gland, and to remember that the cells of the anterior lobe, when growing rapidly, tend to reproduce the structure of a sarcoma. Stains which differentiate granules should therefore be used in the study of all growths apparently originating in the hypophysis.

BENIGN BONE CYSTS (OSTITIS FIBROSA), GIANT-CELL SARCOMA AND BONE ANEURYSM OF THE LONG PIPE BONES. A CLINICAL AND PATHOLOGICAL STUDY WITH THE CONCLUSION THAT CONSERVATIVE TREATMENT IS JUSTIFIABLE

DR. JOSEPH C. BLOODGOOD, of Baltimore: In many lesions technique is ahead of diagnosis. The development of technique is more rapid, because the results of faulty technique are immediate, while the development of diagnosis is more difficult, especially in tumors, because the results are more remote.

Treatment of tumors which will assure the patient the greatest possibility of a permanent cure with the least mutilation will only be accomplished when surgeons have a better conception of the local growth of neoplasms, both benign and malignant. This is especially true of the three lesions of the long pipe bones which I wish to present in this contribution.

The so-called benign bone cyst may present itself in five forms: first, as a medullary cyst without any definite gross lining; second, as a similar cyst with a definite connective tissue lining which is easily stripped from the bony capsule; third, as a medullary mass of fibrous tissue with a small cyst; fourth, as the same medullary mass of fibrous tissue without any cyst formation; and fifth, as multiple medullary cysts.

Among 89 cases of which 20 were personally observed, 69 belong to the variety of true localized bone cyst or ostitis fibrosa. The other 20 cysts have different etiological factors, for example, cysts in enchondroma, in pure myxoma, in giant-cell sarcoma, in ostitis deformans; cysts due to subperiosteal ossifying hæmatoma, and callous cysts.

The true benign bone cysts are pathologically identical. In the cases with no definite lining there is found under the miscroscope between the bone lamellæ of the bony shell the same connective tissue seen in the gross in the other four types. This connective tissue has a definite histological appearance which has been, but should not be, mistaken for spindle-cell sarcoma. In a certain number of cases areas of giant cells are found, but they should not be interpreted as giant-cell sarcoma. Also, one will find, in the gross and with the microscope, islands of cartilage.

At the exploratory incision there is always a thin shell of bone; the contents of the cyst is usually of a dark-brown color and thin; it has never been distinctly hæmorrhagic with large blood clots as the contents of the so-called bone aneurysm. The character of the fluid and the gross appearance of the fibrous tissue should allow one to differentiate this lesion whether it appears as a cyst or a completely solid area. This lesion has been and can be cured by simple incision and curetting. It is distinctly benign, and from an experience over many years with 69 cases it has shown no tendency to malignancy.

The giant-cell sarcoma of which I have studied personally 19 cases can also be recognized at the exploratory incision. The medullary cavity is filled with a soft, hæmorrhagic tissue resembling granulation tissue mixed with whitish areas which, when removed with the curette, come away in masses of irregular shape. This tumor also has been cured by curetting. It is 8 years since I curetted from the medullary cavity of the upper end of the tibia such a tumor, and this patient has no evidence of recurrence to-day. Among my personally studied cases and in the literature I have so far been unable to find metastasis from a giant-cell sarcoma. Cases have been cured even after repeated curetting; amputation is only indicated when the patient has allowed the tumor to grow to such a size that it has perforated the bone capsule and infiltrated the soft parts to such an extent that its complete removal would leave a functionless limb. Even in such cases I believe it will be justifiable to first attempt curetting, use the Paquelin cautery, followed by X-ray treatment. But such extensive cases are unusual. The point that I wish to emphasize is that giant-cell sarcoma can and should be recognized at the exploratory incision and in the majority of cases an attempt should be made to cure the disease with the curette.

The so-called bone aneurysm is a much less frequent tumor. It is distinctly malignant. It is a hæmatoma due to hæmorrhage in the most malignant form of medullary spindle, round, or mixed-cell sarcoma, and I am of the opinion that in this stage of this tumor metastasis has already taken place, so that no harm could come from mistaking such a tumor for a bone cyst or giant-cell sarcoma. I have seen 3 cases. In 2 the diagnosis was not difficult, one patient was not saved by the highest amputation; in the second case amputation was refused; the third case was first treated as bone cyst, amputation was done later, but the patient died of metastasis.

DISCUSSION

DR. RUDOLPH MATAS, of New Orleans: I would call attention to a case in which after removal of a giant-cell sarcoma from the humerus there was such a large cavity that I used about an ounce and a half of Mœsetig-Moorhof cement, and the patient later developed extreme symptoms of iodoform poisoning, as was but natural from the large amount of the cement used. In ten days, however, he recovered from its effects and the arm healed with a perfect contour of the bone. I believe that in Beck's paste we have a most valuable means of filling up cavities, it being superior in my mind to any other paste.

DR. WILLIAM L. RODMAN, of Philadelphia: I recall a case operated upon in 1889 for large giant-cell sarcoma of the lower jaw by free chiseling and curettement but without removal of the maxilla. The patient lived for more than ten years after this operation, and may be alive to-day.

DR. JOSEPH A. BLAKE, of New York: I had a case of sarcoma of the bone, the fourth finger of the patient being diseased. A simple operation in this case proved most satisfactory, and now, three years since operation, there is a normal phalanx.

DR. HARRY M. SHERMAN, of San Francisco: I would say that in my experience salt solution, poured into these cavities a little in excess, just

before the last stitches are taken is as good as any other material for filling; it is replaced by blood and obviates the necessity of putting in any foreign body such as iodoform or bismuth.

DR. DUDLEY P. ALLEN, of Cleveland: Some years ago I removed the lower jaw of a patient for giant-cell sarcoma, leaving but a small portion of the substance of the jaw. I used a splint to hold the teeth in place. The patient recovered entirely and is now well.

DR. WILLIAM S. HALSTED, of Baltimore: I am reminded of a patient with a myxoma of the humerus; although the disease involved the bone from one end to the other there was no cyst and no fibrous tissue. The bone was excised, excepting for a strip posteriorly and at the lower end, and the entire cavity carefully swabbed out with carbolic acid. The patient made a good recovery and had a strong humerus, but there were implantation recurrences in the soft parts on two occasions. It has now been four years since the first operation and the patient at present is perfectly well.

DR. NATHAN JACOBSON, of Syracuse: In reference to giant-cell sarcoma of the jaw I recall one case still living in whom I did a partial excision of the upper jaw for giant-cell sarcoma about 25 years ago. There was never any recurrence. In my experience in those cases of giant-cell sarcoma where there is reasonable cleaning out there is seldom a recurrence of the growth.

PROFESSOR A. VON EISELSBERG, of Vienna: In such cases as these mentioned by the reader of this paper we are in the habit, before finishing the operation, of pouring boiling water into the wound in order to destroy all the germs, and have found it a most satisfactory method.

DR. JOSEPH C. BLOODGOOD, of Baltimore (in closing): Dr. Halsted's case of exostosis with involvement of the humerus brings out the point that pure myxoma is a benign tumor, that recurrence after operation may be due not so much to leaving a portion of the tumor growth behind as to infecting the wound in removal of the tumor. In such cases it would be well to use boiling water, pure carbolic, or Paquelin's cautery to disinfect the wound.

DIAGNOSIS AND SURGICAL TREATMENT OF ŒSOPHAGEAL DIVERTICULA

DR. CHARLES H. MAYO, of Rochester, Minnesota: Diverticula of the œsophagus were described by Rokitansky in 1840 and classified as *pressure* or *pulsion* sacs, and traction sacs. Most cases are pharyngo-œsophageal, determined by the origin of the diverticulum.

The condition is confined to adults. Dysphagia is the most common symptom; cough and dyspnœa are common. Distended sacs are often visible in the neck and can be emptied by pressure. Condition is disclosed by probing and by radiograph of bismuth distended sac.

H. S. Plummer's method of diagnosis is a combination of the technique of Mixter and Dunham, as used in stricture. The patient swallows a silk thread which passes into the intestine. The Plummer perforated acorn probe passed on the thread gives depth of pocket and location of its neck. By alternating the tension of the thread, elevating the probe to the distal opening of the œsophagus, a pocket and its depth can be ascertained and tubes passed for feeding. Gastrostomy for temporary feeding may be necessary.

Operation is as follows: Lateral oblique incision; blunt dissection; exposure of sac and excision; closure by suture; rubber tissue drain.

There have been 8 cases in the Rochester clinic; six operated upon successfully and two which were not operated upon.

REMOVAL OF A TACK FROM THE LEFT BRONCHUS

DR. N. B. CARSON, of St. Louis: Annie Y., aged 4, came to my service in the St. Louis Mullanphy Hospital, January 18, 1909. All that could be learned was that a month before entering the hospital she was supposed to have swallowed an upholsterer's tack, which was followed by a severe spell of coughing, and later by a very serious illness. Physical examination showed the child to be very pale, anæmic, emaciated, and weak. She swallowed either liquids or solids with difficulty, and coughed almost constantly, with an expectoration of white mucus, and the coughing was accompanied by a very severe pain on the left side of the sternum. The left lung was dull in the middle portion, while the upper and lower portions were more or less resonant.

A skiagraph of the chest showed the tack in the median line with the head down, and the point upwards, the point being lodged in front of the body of the fifth dorsal vertebra. Examination of the sputum was negative as was also von Pirquet's test.

On January 27th tracheotomy was done, and an attempt made by means of the bronchoscope to remove the tack, which failed. On January 29th, a skiagraph located the tack about the beginning of the left bronchus. January 30th, under rectal anæsthesia, a section of about an inch of the seventh rib on the posterior auxiliary line, was removed, and an opening made into a small abscess cavity in the lung, which discharged about an

ounce of yellowish pus. At the same time the brochoscope was re-introduced into the tracheal opening, and the left bronchus was found to be entirely closed. On account of the inability to get permission to operate sooner nothing was done until the 27th of July, when an opening was made in the chest over the sixth rib and about 3 inches of the rib removed, and the pleural cavity opened. The lung was entirely solidified and upon exploring the left bronchus at its entrance into the base of the lung, an abscess cavity was located which when opened discharged about a drachm of fetid pus. The tack was found in this abscess cavity and removed.

At 7:30 of the same evening there was a twitching of the left side of the face, arm, and hand, which was followed by a partial hemiplegia. After this the patient improved steadily until the evening of August 2d, when there was a gush of blood from the nose and mouth which was speedily followed by death. Post-mortem showed that there had been an extensive inflammation involving the entire lung, and the pleura of that side. Between the left bronchus and the pulmonary artery was an abscess cavity in which the tack had been lodged after it had forced its way through the bronchus. A small opening was found in the pulmonary artery as a result of the erosion caused by the head of the tack.

DISCUSSION

Dr. Samuel J. Mixter, of Boston: I have operated upon 3 cases of œsophageal diverticula. Where operation is not done, by the passage of very large bougies or probangs by means of a string guide a sufficient dilatation of the spur can be caused to allow the passage of a sufficient amount of food to keep the patient alive. I have about half a dozen such cases now.

Dr. George W. Crile, of Cleveland: I wish to record two cases of operation for œsophageal diverticula, both of which recovered.

Dr. John B. Murphy, of Chicago: The enucleation of the sacs of diverticula is not a difficult matter in itself, but it leaves a large cavity, and it is difficult to avoid the danger occurring from leakage at the suture, infection from the mouth, and particularly the action of the salivary glands upon the loose connective tissue of the mediastinum. I believe not opening the sac at all is the only safe procedure.

With reference to foreign bodies in the bronchus I think more care should be taken to corroborate the history in such cases, as not infrequently on operation no foreign body is found but some pathological condition which accounts for the symptoms.

Dr. George E. Brewer, of New York: I would call attention to one symptom in œsophageal diverticula which is characteristic, that is, the presence frequently during the day, perhaps every hour or half hour, of an accumulation of thick, tenacious mucus which the patient will regurgitate to get relief. My own experience has been limited to 3 cases and one operation. This patient was a woman 80 years of age who had lost 50 pounds through starvation. She made a perfectly good recovery from the operation.

Dr. De Forest Willard, of Philadelphia: Surgeons should always remember the possibility of enlarged thymus in sudden deaths in young infants under ether. In such cases one is very likely to be misled by the statement that the child has swallowed some foreign body.

Dr. William L. Rodman, of Philadelphia: I believe in cases of foreign bodies in the air passages great risk is incurred in delaying the period of operation, and would urge that all such cases be operated upon immediately upon being seen.

Dr. Nathan Jacobson, of Syracuse: I simply wish to refer to one case of a 15 months' old child who swallowed a bean. By a tracheotomy the bean was gradually removed and the child made a good recovery. Regarding misleading histories. I was called to see a child suffering from complete obstruction of the trachea. I was told he had swallowed a piece of bone. Subsequent history showed, however, that the child had inherited syphilis, and evidently had gradually increasing disturbance, and the history of the swallowing of the foreign body was purely an assumption.

Dr. Albert Vander Veer, of Albany: With reference to œsophageal diverticula I would like to mention two cases, one in a physician who refused to have an instrument passed and who subsequently died of an acute pneumonia; the other occurring in a woman about 50 years of age. In this case it was impossible to get into the stomach with any form of instrument and I therefore did a gastrostomy and the patient made a splendid recovery. She now alternates between tube feeding and the natural method.

In regard to foreign bodies in the bronchi and in the air passages, I wish to urge that the bronchoscope be made the last resort in such cases and only be employed in the hands of experienced and careful men.

Dr. Joseph Ransohoff, of Cincinnati: I had a very interesting case of abscess of the lung living four or five weeks after operation, the result of the inhalation of a peanut shell.

I would like to mention a case of a foreign body in the air passages which was unsuspected. Some

two or three months after doing an intubation for laryngeal croup in a little child, the patient expectorated a small triangular tag such as is used to stiffen the corners of pasteboard boxes; the presence of this foreign body had not been suspected at the time of operation.

DR. N. B. CARSON, of St. Louis (in closing): I cannot too strongly urge the observance of the rule that the bronchoscope should only be used by competent and skillful men. I consider it a dangerous instrument when generally used.

SOME OBSERVATIONS REGARDING THORACIC SURGERY ON HUMAN BEINGS

DR. WILLY MEYER, of New York, has so far operated upon 10 cases with the help of his differential pressure apparatus for affections of the pleura, lung, and esophagus. After discussing the effect of differential pressure, in more rapidly bringing to a close the empyema cavity, as well as its usefulness in the after-treatment, he dwells particularly on the cases of two young patients, 6 and 11 years old respectively, who had suffered for years from bronchiectatic abscess symptoms; both were bad risks. He extirpated a lobe of the lung in each case, but neither recovered.

Three times exploratory thoracotomy was done for cancer of the œsophagus with recovery. In order to do good surgical work when operating for a malignant stricture of the œsophagus, he found it necessary to get the scapula out of the way. He, therefore, proposes as a preliminary operation the Schede-Friedrich flap operation, by which the entire shoulder girdle is turned up, thus permitting the surgeon to make his incision into the thoracic cavity wherever required; often two incisions are necessary. Dr. Meyer prefers the intercostal incision to resection of the rib or ribs. He presented illustrations which demonstrated the procedure.

On March 31, 1910, Dr. Meyer for the first time proceeded in this way for a cancer of the œsophagus in a patient 43 years of age. It was found that the malignant tumor extended from about 1½ inches above the cardia to the aortic arch. After division of the œsophagus and inversion of the lower stump through the 6th intercostal, the 3d interspace was opened, and the healthy portion of œsophagus reached, outside of the common carotid artery, after proper division of the costal pleura; then the entire diseased portion was shelled out and brought in front of the aortic arch. To the operator's dismay it was found in the course of this latter part of the operation that the growth involved the right pneumogastric nerve; it was impossible to push the nerve off; it had to be divided at the lower end of the tumor, and again interfered with in amputating the œsophagus above the upper border of the tumor. The proximal end was also inverted by a double purse-string suture, the intention being to do gastrostomy two or three days later. The interference with the pneumogastric nerve had a deleterious effect upon the heart action, which up to this time had been splendid. The operation was well completed, but in spite of intravenous infusion given, the patient succumbed shortly afterward.

It is pointed out that the only hope of operative success in these cases lies in *early* operation, certainly before the intimately adjacent pneumogastric branches are involved, and the first step of such operation should be to prepare free these nerves. Their involvement will more or less decide the operability or inoperability of the given case.

Additional experimental work is required in order to determine how far we are permitted to divide the pneumogastric of one side of the œsophogus should the growth within the latter have encroached upon the nerve. Involvement of the nerve on either side is an absolute contraindication to going ahead with the operation. Interference with the pneumogastrics during the operation greatly affects the heart's action as well as the respiration. The ordinary stimulants, inclusive of intravenous infusion, are of no avail. Sudden changes in differential pressure, however, have been found of great value. The author briefly discussed how best to carry out in such emergency artificial respiration, which he is able to do also with his differential pressure apparatus.

Up to the present time resection of the œsophagus has a mortality of 100 per cent.

END-TO-END INTESTINAL ANASTOMOSIS BY THE INVAGINATION METHOD

DR. C. L. GIBSON, of New York: End-to-end intestinal anastomosis by telescoping one segment into the other has been practiced from time immemorial, but at present has no recognized position in surgery. As a result of animal experiments and five successful cases the author believes that with his present technique it furnishes a method for which there is a demand particularly in the surgery of the lower end of the colon. The technique is as follows:

The upper cut edge of the gut is seized with two Kocher clamps and introduced by these into the lumen of the lower end and maintained there by an assistant. The extent to which it is feasible to accomplish this invagination will vary. The gut is rotated about a quarter circle so that the non-

peritoneal covered surfaces do not entirely approximate in the circumference. Eight to twelve interrupted silk sutures are introduced thus. A Lembert suture is begun on the lower segment, the needle issuing just short of the cut edge, on the upper segment the needle is introduced just above the line where the cut edge of the lower segment lies against the intact wall of the upper. When the knot is tied the free cut edge has been turned inward, and only the peritoneal surfaces are in contact. A continuous running suture is applied over this area further invaginating the first ones, the Kocher clamps being previously withdrawn.

DISCUSSION

DR. CHARLES H. MAYO, of Rochester, Minn.: I want to testify to the invagination method being a good one in the removal of tumors low in the sigmoid, at the upper rectum; in fact, it is about the only way you can get a union, to invaginate the upper end into the lower.

DR. JOHN B. DEAVER, of Philadelphia: I wish to report the following cases in this regard. The first is as follows: In the early part of last winter an artificial anus caused by ulcerative separation of the lower sigmoid at junction with rectum, due to pressure necrosis consequent upon the presence of an old appendical abscess evacuated through the linea alba some weeks previously. Spencer Wells forceps passed up rectum and sigmoid brought down to anus and stitched to freshened margin of anus. Patient made a good recovery. The second case occurred three weeks ago, being one in which the lower sigmoid was damaged in removal by pan-hysterectomy of a uterine tumor involving the bowel. Patient recovered.

DR. ALBERT J. OCHSNER, of Chicago: If immediately upon the appearance of nausea or gaseous distension gastric lavage be instituted there will be fewer instances of intestinal obstruction, following shortly after operation. As regards intestinal obstruction due to conditions appearing many weeks after operation, our observation has been that we have practically no mortality excepting in those cases coming under our treatment after having received cathartics.

DR. E. WYLLYS ANDREWS, of Chicago: End-to-end anastomosis implies for success that we get our lumen at once, and this is not true with the McGraw ligature; but if we can devise a method by which all the advantages of this ligature can be strengthened by obtaining the open lumen immediately, we will have an ideal method.

DR. ALEXANDER H. FERGUSON, of Chicago: In regard to operative obstruction and the prevention of adhesions following operations, I would say that for four years I have used subgalate of bismuth, smearing it over all raw surfaces, with most complete satisfaction.

DR. ARPAD G. GERSTER, of New York: If we want to make headway against obstructions caused by adhesions we must first know the cause of the adhesions, and this we do not know at present. Many causes have been exploited, the use of packings, the handling of the intestines, and other mostly traumatic lesions to the peritoneal coat, but we have seen in the presence of the greatest traumatism that could be inflicted on the intestine that adhesions did not form. Here the pathologist and experimental surgeon must come to our aid. I believe that the cause must be looked for in certain conditions of the blood of the patient.

ABNORMAL POSITION OF THE DUODENUM

DR. G. E. ARMSTRONG, of Montreal, Canada: The duodenum is singularly constant in its relations, course, and length; and exceptions are exceedingly rare and worthy of note.

In the anomaly reported the duodenum ran to the right and then turned downwards external to the hepatic flexure, ascending colon, and cæcum, and, merging into the jejunum, passed from without inwards below the cæcum into the small intestine area. The duodenum was completely surrounded by peritoneum. It had a long mesentery throughout and could easily be held two or three inches in front of the abdominal wall. The head of the pancreas, closely applied to the duodenum, was visible, and palpable between the layers of the duodenal mesentery, and readily followed the duodenum when the latter was brought outside the body.

Instead, therefore, of passing across the second lumbar vertebra and behind the transverse colon and superior mesenteric artery, it retained an early embryological position. There was of course no ligament of Treitz and no fossa duodeno-jejunalis. The condition is clearly one of arrested development. The cæcum in this case did not mount upwards to the lower hypochondrium and did not pass in front of the loop of the duodenum. The cæcum did not descend to its usual final resting place in the right iliac fossa. It was high, completely surrounded by peritoneum, very movable, and could be brought out through the epigastric incision and held eight inches in front of the body.

DISCUSSION

DR. MAURICE H. RICHARDSON, of Boston: I would report a case in which the appendix, the gall-bladder, the liver, and the ileocæcal valve were

on the left side, the spleen on the right side, and the heart on the right side.

DR. EMMET RIXFORD, of San Francisco: I would like to put on record a case of failure of rotation of the primary gut. The explanation of this condition is probably to be explained on the basis of adhesions of the cæcum to the parietal peritoneum the result of a fœtal peritonitis.

DR. LEONARD FREEMAN, of Denver: I had a case in which acute dilatation of the stomach followed an unimportant pelvic operation, and which at autopsy showed the duodenum passing directly beneath the liver and firmly attached to the posterior abdominal wall and around the right side as far as the hepatic flexure of the colon.

DR. JOSEPH A. BLAKE, of New York: I have met with two cases of abnormal position of the duodenum in my practice. I do not think there is apt to be dilatation in such cases, as the mesenteric vessels do not cross the duodenum, and the duodenum instead of being bound down is usually free.

DR. ALEXANDER PRIMROSE, of Toronto: I would like to emphasize the fact that these conditions of abnormality in the position of the duodenum may occur without giving rise to the slightest symptoms.

DR. JOSEPH C. BLOODGOOD, of Baltimore: I would like to record one other anomaly of the intestinal tract which I think must be very unusual, namely, absence of the appendix.

REPORT OF A CASE OF HEPATICO-DUODENAL ANASTOMOSIS

DR. GEORGE EMERSON BREWER, of New York: The patient was admitted to the Roosevelt Hospital suffering from acute cholecystitis. Following a cholecystectomy there occurred extensive sloughing of the wound, which was followed by a complete biliary fistula. At the end of 75 days as no bile was passing into the bowel, the abdomen was reopened, and the fistula followed down to the common hepatic duct. As no trace of a common duct could be found even after reflecting the duodenum and exposing the head of the pancreas, it was assumed that it had been destroyed by the suppurating process which followed the primary operation. A rubber drainage tube, three inches in length, was introduced into the hepatic duct and also through the duodenum by a stab wound at its upper border, and was secured in these two situations by two purse-string sutures. A mass of omentum was then wrapped around the tube, extending well beyond its introduction in the hepatic duct and duodenum with a view to create a new common duct after the manner suggested by Sullivan. The abdominal wound was closed, a small cigarette drain being allowed to remain at its upper angle. From that time no bile appeared in the wound. The bowels moved on the third day as the result of an enema, and the stools contained an abundance of bile. The reconstructed duct continued to functionate until after the man's discharge from the hospital some four or five weeks after the last operation. Since then he has had two or three attacks of fever associated with jaundice which would disappear in two or three days. At the present time he is still jaundiced, although some bile is present in the stools. Dr. Brewer asked the advice of the members of the Association as to further treatment in case the newly constructed duct became totally occluded.

DISCUSSION

DR. ALEXANDER H. FERGUSON, of Chicago: Since the observation that if all the bile is directed into the hepatic flexure of the large bowel the patient does not suffer from the lack of bile (which observation I believe was first confirmed by Mayo Robson) I have followed this technique in at least half a dozen cases with extremely gratifying results.

DR. JOSEPH C. BLOODGOOD, of Baltimore: I would like to report an anastomosis of small intestine by opening the transverse colon as in posterior gastroenterostomy, sewing a long loop of the small intestine through the transverse colon, and suturing it to the gall-bladder.

RESECTION OF THE PANCREAS, WITH REPORT OF A CASE

DR. J. M. T. FINNEY, of Baltimore: The principal object of this communication is to record the successful removal of a primary solid tumor of the pancreas. The operation involved the resection of the entire middle portion of the gland, leaving only a small piece of the head and the tail respectively and necessitating a reunion of these segments by suture. A search of the literature reveals records of but 16 other undoubted cases in which the pancreas has been resected, either in whole or in part, for primary tumor of the gland.

A review was given of the recent advances of surgery of the pancreas due to experimental and clinical work. The difficulties of operating upon the pancreas were referred to and the best methods of avoiding and controlling the same. The best methods of dealing with pancreatic fistulæ were next taken up. The diagnosis of primary solid tumors of the pancreas is made usually by exclusion, and it is not always possible beforehand. Different routes for attacking pancreatic tumors

were discussed and the various operations which had been suggested were described. These were so difficult and dangerous as to prevent their general use.

The statistics of the operation for primary tumor of the pancreas were given. Of the 17 cases, 12 occurred in females and 3 in males. Carcinoma occurred 10 times, sarcoma 4, fibroadenoma 2, cystic adenoma once. Of the 17 cases, 9 recovered and 8 died. In two instances the pancreas has been reported as having been removed in toto. Three times the gland was completely divided into two parts and the remaining portion sutured. All three recovered.

DISCUSSION

DR. M. L. HARRIS, of Chicago: I would like to mention a case of a policeman shot by a 38-caliber bullet which entered just below the 12th rib on the left side and was found just beneath the skin a little to the right of the median line between the 8th and 9th ribs. The track of the bullet from before backward was through the right lobe of the liver, the lesser curvature of the stomach, the middle of the pancreas, practically bisecting the organ, and the left kidney. The stomach was sewed up, then the pancreas, and as close an approximation of parts made as possible. Drainage front and back. Fistula resulted but closed in about three months and patient fully recovered.

DR. G. E. ARMSTRONG, of Montreal: With regard to the mobility of pancreatic tumors I would like to mention a case in which there was a large pancreatic cyst which for a long time, because of its mobility, was considered to be a growth in the stomach.

DR. WILLY MEYER, of New York: I have had two cases in which the tail of the pancreas was tightly adherent to the existing tumor, and here I put a piece of chromicized gut around it and divided the distal end with the Paquelin cautery. Both patients recovered.

DR. RUDOLPH MATAS, of New Orleans: I wish to report an additional case of unusual character, thrombosis of the splenic artery incidentally involving the pancreatic arterial supply, causing degeneration of the organ from the head to the tail, associated with multiple tumor formation in the spleen. The spleen and three-quarters of the pancreas were removed and the patient recovered from the operation, dying about three years later from a slow fever.

CONGESTION OF THE LOWER LOBE OF THE RIGHT LUNG AN EARLY SYMPTOM IN APPENDICITIS

DR. JOHN B. ROBERTS, of Philadelphia: The author suggested the possibility of a secondary congestion of the lower part of the right lung being found in a considerable number of cases of acute appendicitis. He spoke of this condition being a possible aid in the diagnosis of acute appendicitis when the symptoms of the latter were not yet very definite. A point was made that this observation did not refer to secondary pleuritis and pulmonary involvement occurring in the late stages of appendicitis. Such inflammation from septic invasion secondary to advanced appendicitis was an entirely different process. The idea of the author evidently was that appendicitis and perhaps other intra-abdominal inflammations, might cause atelectasis of the right lung, or a true congestion, because of the insufficient action of the diaphragm upon the right side. This spasm or immobility of the right side of the diaphragm he compared with the tonic spasm of the muscles overlying the appendix in the front of the abdominal wall. It was, however, also suggested that the engorgement of the base of the right lung in cases of appendicitis might be due to a simultaneous infection of both the appendix and the lung by the pneumococcus or other invading organism. The well known fact that pneumonia is sometimes accompanied by pain and muscular rigidity in the right iliac fossa was mentioned, as was also the clinical observation that acute appendicitis may in its early stages give rise to pain in the right lower thoracic region. The early congestion of the right lung, which Dr. Roberts thinks he has found in the early or initiatory stages of appendicitis, might also occur from inflammation of the gall-bladder or cellulitis around the upper pole of the kidney. The paper referred to somewhat similar observations by other writers, which seemed to at least partially confirm the correctness of the value of this new point in the diagnosis of appendicitis.

VACCINE THERAPY AS AN ADJUNCT TO SURGERY

DR. JOHN B. DEAVER, DR. JOHN C. DACOSTA, JR., and DR. D. B. PFEIFFER, of Philadelphia: There has been established at the German Hospital a special department of vaccine therapy. In addition to its well known and satisfactory use in suppurative affections of the skin and other forms of minor chronic infection, this form of treatment has been used as an adjunct in the treatment of more severe surgical infective conditions.

Vaccines did not prove of service in three cases of streptococcic septicæma in which the treatment was begun late. Four cases of severe staphylococcic septicæmia recovered, improvement in each case beginning with the initiation of the vaccine treatment. Eight cases of severe septic intoxication without demonstrated bacteræmia were treated

by drainage and vaccines. Two were in extremis when treatment was begun and died shortly afterwards. The remainder recovered. Five of the cases were streptococcic infections.

Improvement was also noted in a miscellaneous group of cases comprising persistent sinuses, cystitis, thrombosis, etc. Not all cases, however, gave a definite response. The dosage varied from 25,000,000 to 750,000,000. The sicker the patient and the less satisfactory the response, the smaller and less frequent should be the dose. Streptococcus also was used in smaller dosage than staphylococcus.

On the basis of these results the paper concludes:

Specific vaccine treatment in our hands has not proved of benefit in the later stages of streptococcic septicæmia.

Staphylococcic septicæmia has been treated with most favorable results at all stages.

Septic intoxications without demonstrated blood invasion in a majority of the cases display general and local improvement under the use of vaccines if given early; the later the treatment, the less certain and satisfactory the result.

Localized and persistent suppurating lesions are sometimes markedly benefited by vaccines.

Surgical procedures for the relief of infectious conditions should be reinforced by vaccine treatment which should be begun as early as is consistent with the case, and preferably by autogenous organisms.

No hospital can be considered fully equipped which is not prepared to supply this form of treatment in conjunction with established measures.

This paper will appear in full in a later issue of SURGERY, GYNECOLOGY AND OBSTETRICS.

THERAPY BY BACTERINS AND TUBERCULINS IN MIXED SUPPURATIVE BONE AND JOINT DISEASE

DR. DE FOREST WILLARD, and DR. B. A. THOMAS, of Philadelphia: The authors recount their experience of two years' duration in the treatment by bacterins and tuberculins of tuberculous bone and joint disease, complicated by mixed pyogenic infections. The feature of the treatment consists in the alternation of bacterin and tuberculin inoculations in the mixed suppurative type of the disease, as spinal caries, tuberculous hip-joint disease, etc. They do not contend that bacterin therapy is a "cure-all," nor that when indications for surgical intervention exist, they can be disregarded and active immunization substituted. They wish, however, to emphasize the fact that the *accessory* employment of bacterin and tuberculin in certain cases stimulates the tissue cells of the organism to the production of specific antibodies to assist the bodily defenses in antagonizing and combating the given infections. On the other hand, the incompetent, inexperienced, and careless use of these measures will not only fail to effect cure but will inevitably lead to disaster and thrust a therapeutic measure of worth into disrepute. Bacterins, particularly tuberculin, are more potent agents for evil than for good, unless wisely administered. They are invaluable aids in competent hands and when so employed these cases do better with than those treated without bacterins; their detention in the hospital is shortened, and complications, if they occur, are fewer and less severe.

The authors present two definite clinical types of disease illustrated by charts, in which therapy by bacterins and tuberculins is recommended. The first type is represented by the case in which already at the time of operation a mixed infection of hæmatogenous or exogenous origin has been superimposed upon suppurative tuberculous caries. The second type is manifested in the evacuation and drainage of a "cold abscess" in which case almost invariably after a lapse of 15 to 20 days, the temperature suddenly rises and symptoms of a mixed infection ensue.

These types of disease are of a serious character, not those mild cases which would recover following simple incision and evacuation, nor those neglected ones of prolonged suppuration, characterized by bacteræmia, grave saprœmia and amyloid disease, but those with chronic localized processes, the treatment and prognosis of which have been greatly handicapped by the intervention of various pyogenic bacteria.

The authors have found that in the course of weeks the various pathogenic bacteria isolated from the suppuration vary, and for that reason they insist upon the employment of autogenous bacterins, the pus being cultured and recultured at least monthly. As soon as the patient's temperature falls to 100 degrees or preferably lower, under the administration of bacterins, inoculations with tuberculins, either alone or alternating with bacterins for a time, are begun. They conclude, judging from the cases under their observation, that better results have attended the process of active immunization, when, just as in tuberculin therapy, pure and simple, the treatment has been commenced with relatively small bacterial inoculations, progressively increased to the therapeutic limit, rather than by recourse to large dosage, thereby in the former case establishing immunity, and in the latter avoiding anaphylaxis.

Studious observations of the clinical symptoma-

tology have always sufficed to control the treatment, the opsonic index proving not only impractical but unreliable.

DISCUSSION

DR. J. M. T. FINNEY, of Baltimore: In regard to the use of vaccines in chronic infections of the bladder from the colon bacillus, I would mention a case in which, after every other method had failed, injections were followed by the most astonishing results, the bladder symptoms all practically disappearing.

DR. WILLIS G. MACDONALD, of Albany: I would like to call attention to the extreme importance of not giving too large a dose of vaccines, as I have found this regulation of the dosage very troublesome in those cases in my experience.

SURGEON-GENERAL STERNBERG, of Washington: It is impossible to doubt that vaccine treatment is beneficial in a certain class of cases, but it is difficult to understand why it should be. You have a certain specific micro-organism in the blood in large numbers, producing toxic products, and why the introduction of a comparatively small number of the same micro-organisms under the skin should have such a potent effect in arresting the progress of the disease is to me inexplicable.

DR. L. L. MCARTHUR, of Chicago: I want to call attention to the tuberculin treatment in essential hæmorrhage of the kidney. Treatment with the autogenous vaccine of the colon bacillus in several such cases has been productive of a cure, and I consider this a most beneficial treatment in this condition.

DR. JOHN B. MURPHY, of Chicago: The essential hæmorrhage of the kidney, the essential hæmorrhage of the uterus occurring in girls under 20 with tuberculous histories, respond marvelously to proper dosage with tuberculin. Great assistance is rendered by this treatment in cases of bone tuberculosis. There is, however, no more treacherous and dangerous a drug than tuberculin if improperly given. As a stimulant, and as an aid to surgical tuberculosis, I know of nothing so good when the treatment is carefully administered.

DR. JOSEPH C. BLOODGOOD, of Baltimore: I have had no experience in the vaccine treatment but would like to suggest in regard to the essential hæmorrhage of the kidney that a more simple serum be tried first. The professor of pathology at Tufts College has demonstrated the rapidity with which blood serum of all animals will check hæmorrhage, so perhaps it is some antibody in the serum and not the organism that checks the hæmorrhage when tuberculin is used in these cases.

DR. JOSEPH A. BLAKE, of New York: I have been employing the vaccine treatment pretty persistently and in chronic infections have found the autogenous vaccines of great benefit.

DR. ARTHUR DEAN BEVAN, of Chicago: From my limited knowledge I would consider it too early at this time to arrive at any definite conclusions with regard to the value of this treatment. I have been particularly interested in the application of the vaccine treatment to tuberculosis of the kidney and mixed infection of tuberculosis of the colon, and although I know of cases which under good management with this treatment have gone on to recovery, I also know of cases which without the vaccine treatment also recovered.

DR. FRANCIS B. HARRINGTON, of Boston: I have seen some cases in which autogenous vaccines have been of great benefit, and also some cases in which they were productive of great harm.

DR. HARRY M. SHERMAN, of San Francisco: We are using tuberculin more and more in the Children's Hospital. With regard to the vaccine treatment we have had no success with the streptococcus infection.

DR. EMMET RIXFORD, of San Francisco: I would like to mention a case of tuberculous anal fistula, tuberculosis of the spinal cord, and tuberculosis of the wrist, which under treatment with tuberculin was completely restored to health. It has been two years since the treatment, there is now no sign of tuberculosis, and the patient has gained 40 pounds in weight.

DR. JAMES E. MOORE, of Minneapolis: I have been disappointed in the serums for the treatment of acute infections. In tubercular cases I have had better results. It is very essential that these treatments should be carried out only by those who know how to use them.

DR. CHARLES A. POWERS, of Denver: In chronic infections, especially the chronic staphylococcic infections, the autogenous vaccines have not given me the encouraging results which many others have obtained, and I therefore attribute this to faulty methods.

DR. CHARLES H. MAYO, of Rochester, Minn.: In regard to the vaccine treatment I would say that I have had very little experience with it, but I have had one case of colon infection of the bladder and kidney in which the autogenous vaccine has proved of benefit.

DR. JOHN B. DEAVER, of Philadelphia (in closing): The toxin treatment is most satisfactory if used judiciously. Like all good surgical measures, it must be instituted early to obtain the best result. The dosage is most important and should be carefully studied and regulated to the individual case.

DR. DE FOREST WILLARD, of Philadelphia (in closing): There are four things to remember in the

use of tuberculin. First, tuberculin is a potent agent for evil as well as for good. It must be used carefully and in careful hands. Second, if a stock vaccine is used by incompetent men the treatment will have disastrous results. Third, the dose must be exceedingly small, for the smaller the dose and the longer time consumed in the treatment, the more certain the beneficial results. Fourth, it is by no means a substitute for surgical procedures.

THE STUDY OF THE ETIOLOGY OF CANCER BASED ON CLINICAL STATISTICS

DR. ISAAC LEVIN, of New York: The investigations are based upon a clinical study of 4,000 cases of carcinoma and sarcoma collected from several large hospitals in the country, the analysis of which showed many results of interest. The greater frequency of the disease in women is due to the prevalence of cancer of the uterus and the female breast. The other organs become affected more frequently in men, which fact may be due only to the greater subjection of the latter sex to the different injurious influences of civilized life. Cancer, while considered to be a disease of an advanced age, appears, according to this investigation, to occur in many instances in people who have not yet reached middle age. Child-bearing does not seem to have any direct connection to the causation of cancer. Another point of interest is the fact that American Indians rarely contract the disease. The data on the influence of occupation in the etiology of the disease were very defective, and no conclusion could be derived from them. It is expected that with the co-operation of the profession better results will be obtained in this connection in the future work. The presence of a preceding local disease in the organ affected with cancer, while of certain importance, cannot be considered as the main etiological factor. Hereditary disposition does not seem to have an influence upon the causation of the disease sufficient to warrant the great dread of the lay public before this hereditary trait.

In conclusion, the statement may be made that while this investigation cannot claim to have reached any final result in the elucidation of the etiology of cancer, it appears evident that a local trauma or previous disease of the affected organ is of less importance in the causation of cancer than the increased vulnerability and lessened resistance of the organism caused by the ever-increasing strain of the modern life. This is certainly the only explanation that may be offered for the increasing frequency of the occurrence of cancer in civilized communities. That this increase is not only apparent is very evident from the mortality statistics of the United States in 1907, which show a ratio of 73.1 deaths from cancer per 100,000 population, as compared with the ratio of 70.8 in 1906.

It is expected that this statistical cancer research, which is still being continued, may arouse an interest in the matter in the members of the profession, who are requested to fill out the schedules which may be obtained on demand and offered free examination of tumor tissue.

DISCUSSION

DR. CHARLES A. POWERS, of Denver: I want to call attention to the formerly prevalent idea that youth was a bar to carcinoma. During the past year I have had no less than three patients under twenty-four years of age suffering from epithelioma.

ON THE SIMULATION OF NEOPLASMS BY INFLAMMATORY PROCESSES

DR. C. A. HAMANN, of Cleveland: The resemblance, clinically, between certain inflammatory processes and tumors, leads to errors in diagnosis.

Chronic osteomyelitis and other forms of bone disease resulting in enlargement of bones; formative osteitis, as the result of various irritants, leads to the production of swellings which simulate neoplasms. Methods of differentiation. Myositis ossificans, circumscribed enlargements of muscles, myositis fibrosa.

Inflammatory thickening around foreign bodies in abdominal wall ("ligature and foreign body tumors"), inflammation of the omentum after ligation of portions of it.

Pseudoneoplasms of stomach. Inflammatory pseudoneoplasms of intestines; periappendicular swellings; diverticulitis, associated with the formation of connective tissue masses; tumors of the rectum and perirectal tissues, inflammatory in origin. So called disappearing tumors are in many instances inflammatory pseudoneoplasms.

Chronic mastitis in some of its various forms.

DISCUSSION

DR. HARRY M. SHERMAN, of San Francisco: I would like to report an instance in which I, through a mistaken diagnosis, removed an inflammatory mass believing it to be sarcoma, including the parotid gland. A radical operation was done, beginning with the clavicle, with removal of all the tissues up to and including the parotid gland, following the report on a section of the growth sent to the pathologist that it was probably of sarcomatous origin. When the whole mass was sent to the laboratory for examination, however, it was

proven to be an inflammatory mass in the center of which was a normal parotid gland. In the light, however, of no clinical symptoms of syphilis and a negative Wassermann, and a definite tumor mass, the evidence against syphilis in the diagnosis was enough to justify the operation for sarcoma.

A REVIEW OF ONE HUNDRED AND TWENTY RESECTIONS OF THE RECTUM FOR CANCER

DR. WILLIAM J. MAYO, of Rochester, Minnesota: Total number of resections of the rectum for cancer, in St. Mary's Hospital, from April 21, 1907, to December 31, 1909 120

Males	63	
Females	57	
Age of oldest	81	
Age of youngest	27	
Average age	52.12	
Perineal route —		
Perineal resection	11	
Quenu-Tuttle	22	
Harrison-Cripps	5	38
Posterior route —		
Kraske: Modified	51	
Resection continuity	5	56
Abdominal combined —		
Combined	20	
Combined with permanent colostomy	6	26

Operative mortality. This includes all cases dying in the hospital following operation without regard to cause or length of time. Three deaths occurred from exhaustion more than four weeks after operation, one from pulmonary embolus, and one from apoplexy.

Total number	120
Mortality	20.16%
Total number during 1908–09	44
Mortality	4.9 %

Amount of bowel removed—	
Lower rectum	5
Middle rectum	5
Entire rectum	75
Entire rectum and part of sigmoid	32
Entire rectum, part of sigmoid, uterus, ovaries, tubes, part of vagina	1
Rectum and prostate	2
Total	120

Pathologist's report—	
Carcinoma	119
Sarcoma	1
Total	120
Operated upon more than 5 years ago	32
Present condition known	17
Alive and well—	
2 abdominal (1 over 9¾ yrs., 1 over 5 yrs.)	
2 perineal (1 over 9 yrs., 1 over 7¾ yrs.)	4
Operated more than 4 yrs. ago	41
Present condition known	26
Alive and well (4 abdominal, 3 perineal, 6 posterior)	13
Operated upon more than 2 yrs. ago	82
Present condition known	63
Alive and well	26
Operated upon more than 1 yr. ago	102
Present condition known	82
Alive and well	36
Operation less than 1 yr. ago	18

DISCUSSION

DR. ARTHUR DEAN BEVAN, of Chicago: There is a point of technique I wish to emphasize after an experience with some 20 cases in which the Kraske operation was performed. That is, during the Kraske operation we do not employ a single ligature, but simply as we come to the tissues on the sides of the incision freeing the rectum, massive 10″ or 12″ clamps are put on the tissues, for instance, high up on the levator ani muscles and on the inferior hæmorrhoidal vessels which supply the rectum and the lower part of the sigmoid. With the employment of these clamps there is less risk of hæmorrhage and a greater saving of time than if an attempt is made at ligation.

DR. JOSEPH C. BLOODGOOD, of Baltimore: One of my first cases, operated on about six years ago, was such that we were able to save 3 inches of the anus and rectum, making a suture of the sigmoid which was brought down, and this patient has not only been as well as before, but has perfect function.

DR. ALEXANDER H. FERGUSON, of Chicago: In some of these cases I have resorted to the combined operation in two stages to advantage. Open the abdomen, take the proximal end of the bowel, make an artificial anus, invert the distal end into the rectum — that would be one operation; then, when the patient is in good condition, remove the rectum from below, the bowel being already inverted giving ready access to the mass. By the use of clamps without ligatures the operation can be done in a few minutes.

DR. JOSEPH A. BLAKE, of New York: I have had more experience with the combined operation than with any other; I have done 12 consecutive operations in that way without any mortality. The mortality is less if a permanent colostomy is done; it avoids infection and the operative field is kept comparatively clean, and it also affords the opportunity of removing the whole growth at the

lower part of the bowel. This procedure should be confined to those cases at the middle of the rectum or above, and those in which the anal sphincter is involved and has to be removed.

DR. G. E. ARMSTRONG, of Montreal: In the low cases where the sphincter has been involved I have sometimes succeeded in getting a satisfactory sphincter by bringing the upper ends down through the lower fibers of the gluteus maximus. One such case operated upon ten years ago now has perfect control.

DR. WILLIAM J. MAYO, of Rochester, Minn. (in closing): We have some very satisfactory cases of union between the sigmoid and lower portion of the rectum, and the rule has been, when made from above it has been all right, but when made through the posterior incision, or through the vagina, there is ulcer and fistula. In regard to permanent colostomy, I have often regretted not employing this procedure, because some of our deaths have been due to infection.

I wish to emphasize the point that it is practically impossible to make honest percentages of cases such as these, for the reason that if all cases which cannot be traced are counted as dead the mortality rate would mount up. This is the only way, however, to consider such cases of which we have no absolute record, and proves the inaccuracy of any percentages which we may try to strike.

CHORIOCARCINOMA: REPORT OF A CASE OCCURRING IN A PATIENT WITH AN INFANTILE UTERUS

DR. A. PRIMROSE, of Toronto, Canada: Tumors variously described in individual instances as chorioepithelioma, deciduoma malignum, syncytioma maligna, etc., have hitherto been considered as overgrowths of chorionic villi which invade the blood sinuses of the uterine wall, and then rapidly disseminating, present the clinical picture of great malignancy.

A neoplastic growth of this character may occur after normal pregnancy. In addition, however, it may follow miscarriage or it may make its appearance after the removal of a vesicular mole. In cases of ectopic gestation the tumor elements have been demonstrated in the gestation sac. In 1903 Teacher published the results of an exhaustive study of chorioepitheliomata and his views have generally been accepted that they arise in connection with pregnancy and originate from the chorionic epithelium which is of fœtal epiblastic origin.

The tumor removed presented the characteristic elements of a choriocarcinoma with a very large proportion of Langhans' cells showing metaplasia and mitosis. A few isolated masses of the syncytium were also present.

These tumors may exhibit a histological structure in which fully formed villi may be present or the cellular elements of that structure in varying proportion. Secondary growths are common in the vagina or in the lungs, but occasionally metastases occur in the liver, kidney, and other organs. There is a relationship between pathological processes resulting in a neoplasm and physiological activity because the invasion of the maternal uterine tissues of the villi occurs as a normal process in pregnancy. Increased activity in this direction may lead to malignant infiltration and tumor formation. A further fact of interest is that in normal pregnancy normal chorionic elements are carried to the lungs and lodged in the pulmonary capillaries and there undergo absorption.

The clinical course of chorioma presents great variation. The primary growth may disappear spontaneously and this may occur whilst secondary metastases continue and produce a fatal issue. Hæmorrhage, pain, anæmia, and extreme emaciation are frequent symptoms and where metastases occur in the lungs then we have cough and hæmoptysis.

Ewing's classification is the most valuable guide for prognosis and treatment.

Chorioadenoma in which the structure of the villus with its normal histological arrangement is reproduced.

Choriocarcinoma in which Langhans' cells are chiefly in evidence and where marked mitosis is observed.

Syncytial endometritis where the maternal tissues are invaded with wandering cells derived from the syncytium.

Syncytioma where transitional types are in evidence.

Of these the choriocarcinoma is extremely malignant and is probably invariably fatal. The other forms present great variation in their degree of malignancy and may even disappear spontaneously or after partial removal.

Where spontaneous disappearance does occur Teacher has shown that the process is brought about by fibrosis and encapsulation.

PROGNOSIS AND OPERATIVE TREATMENT OF FRACTURE OF THE BASE OF THE SKULL

DR. JOSEPH RANSOHOFF, of Cincinnati: The paper was based on an analysis of 190 cases occurring during the last ten years in the Cincinnati Hospital. One hundred and twenty-four of the cases were fatal. The prognosis is influenced by the depth of the coma chiefly and even in greater degree by the fixed condition of the pupils. Of 42 patients with non-reacting pupils, 41 died. In

5 years there were 19 operations, trephining or decompressive, with 7 recoveries. The conclusions of the paper were as follows:

1. There will always be a large mortality connected with basal fractures; death resulting from primary shock, brain laceration, or hæmorrhage. Thirty-seven per cent of the fatal cases die within 6 hours or less, and 56 per cent die within 12 hours. It is not probable that the mortality of this class of cases can ever be reduced with or without operation. They are primarily fatal.

2. Twenty-three per cent of the fatal cases die during the second 12 hours of the first day; and 6 per cent die during the second day. They are the cases in which the coma is not profound, in which the pupils are not fixed, in which the breathing is not stertorous, and in which there is not complete muscular relaxation. With a slow full pulse and lumbar puncture indicating hæmorrhage and increase of intracranial pressure, a trephining operation is indicated. In the doubtful cases an operation is indicated.

3. In this class of cases, where facilities for the major operation of trephining are not at hand, repeated lumbar puncture should be essayed. This procedure may be destined to take the place of decompressive operations.

4. There is a large group of cases in which there is complete consciousness or in which there is a somnolence or milder degree of coma; and in whom the concomitant symptoms do not indicate a grave intracranial trauma either to the brain or its vessels. The pupils, though uneven, react; involvement of one or more cranial nerves may be evident. The symptoms singly or collectively are not ominous at any time. Eighty per cent of this class of cases have a tendency to get well with or without operation. They should not be operated on unless the symptoms indicate an increase of intracranial pressure from hæmorrhage, beginning cerebral œdema, or distinct localizing (cortical) symptoms.

5. There is a distinct class of cases in which operation is indicated. They are cases which seemingly not severe in the beginning grow progressively or suddenly worse, showing signs of increased intracranial pressure. Decompressive operations may save a considerable proportion of them.

6. It has yet to be determined where the trephining should be done to obtain the best results. Since most fractures involve the anterior or the middle fossa, subtemporal trephining is doubtless the procedure oftenest indicated. When, however, a hæmatoma in the mastoid or occipital region indicates an involvement of the posterior fossa, the operation should be subtentorial. To relieve the subtentorial tension by an opening made in the temporal region is illogical and may be dangerous. I attempted it recently in a cerebellar tumor, the site of which could not be determined. The patient succumbed within two weeks with symptoms of bulbar paralysis.

DISCUSSION

DR. FRANK E. BUNTS, of Cleveland: In an ordinary case of fracture of the base of the skull in which the blood pressure can be obtained, a beginning choked disk and œdema, and hæmorrhage in the brain detected, the decompression operation should be performed, and in many such cases we may expect altogether beneficial results.

DR. JOSEPH C. BLOODGOOD, of Baltimore: Up to the present time I have been unable to find any case of epilepsy following an injury to the skull in which some piece of the skull was removed, either by operation or by the injury itself. This would rather substantiate the view that epilepsy is more apt to be started up by changes in pressure than by actual injury.

DR. G. E. ARMSTRONG, of Montreal: If in these cases the pressure is subtentorial, as indicated by the respiration, aspiration of the cerebrospinal canal may prove very injurious.

Regarding Dr. Bloodgood's remarks I would like to report two instances where epilepsy has followed in the presence of considerable defect in the skull; one following the kick of a horse in a young man, where there was rupture of membrane, loss of brain tissue with considerable defect in the skull remaining, and epilepsy beginning a couple of years later; the other, in a man injured in the frontal region in which there is a considerable defect in the skull, and epilepsy has followed.

A METHOD OF OVERCOMING THE SHORTENING IN OLD FRACTURES TREATED BY THE OPEN METHOD

DR. EDWARD MARTIN, of Philadelphia: It was because of the complete futility of any method of traction which could be applied to the leg and foot in the case of a ununited fracture of the femur with 2½ inches of shortening that the present method of overcoming the shortening was devised. It consists in a long, strong canvas strip pocketed in the middle and looped at the ends. The bones at the seat of fracture are freed, the pocket is slipped over the proximal end of the distal fragment, the ends of the canvas strip are carried in the long axis of the limb, and in the loops is fixed a cord to which are attached the weights. By thumb pressure the bone is kept from angling out of the wound, and weights up to 100 pounds, or

even more, are attached to the rope. In from three to five minutes the shortening is overcome. Only those structures which interfere with proper placement are stretched, and this is done so thoroughly that there is but slight tendency to the reproduction of deformity.

DISCUSSION

DR. RICHARD H. HARTE, of Philadelphia: In regard to extension I consider a pulley similar to that used on boats, a double and single pulley, to be the best type to use. These should not be close together, but enough line between them to allow of manipulation of the limb by the operator. After a thorough incision has been made and the ends of the bone exposed, you can disengage the bands of tissue by the employment of steel elevators. It is important to do as little damage as possible to the tissues. I do not consider silver plates strong enough to hold the bones in position and therefore would always advise the use of a heavy steel plate such as that suggested by Lane.

DR. ALBERT J. OCHSNER, of Chicago: I would like to describe a method which we use almost entirely. It consists in the slow stretching of the muscles, instead of the rapid stretching, and the only thing that is peculiar about the method is the application of rubber adhesive strips to as high a point above the seat of fracture as is possible. For instance, instead of applying the rubber adhesive up to the fracture, it should be applied over the entire length of the thigh, then, with no more than 24 pounds of weight, we have, in every fracture where there has not been a union, been able to stretch the muscles sufficiently to replace the fractures without making a resection of the ends. In cases where there is a union in malposition, the muscles will stretch to a marked extent. It is important to use two Lane plates, with two screws at each end in order to keep the bones from slipping.

DR. JAMES E. THOMPSON, of Galveston: I think the important point is that it is not the contraction of the muscles which prevents reduction, it is hæmorrhage, and after this blood clot has been evacuated the bones can be held in proper position.

DR. HARRY M. SHERMAN, of San Francisco: The method of extension described by Dr. Harte I do not consider as good as where two hanks of yarn are applied as perineal straps, the weight coming on the tuberosity of the ischium. On the foot is put another hank of yarn. The pulling upon the bones has been measured, and over 200 pounds of weight have been applied in some cases without injury to the ligaments of the ankle or knee, and that is sufficient to pull out any tissue interfering with the approximation of the bones.

DR. EDWARD MARTIN, of Philadelphia (in closing): The length of the screws used in adjusting these plates should be the thickness of the bone, should be threaded up to their heads, and to hold the plate in place it is required that they penetrate entirely through the bone and no more.

In cases of extension we prefer to use the old-fashioned resin plaster, properly made, because the rubber plaster always excoriates the skin.

FRACTURE DISLOCATIONS OF THE OS INNOMINATUM

Dr. HARRY M. SHERMAN, of San Francisco: The paper made the point that simple uncomplicated fractures of the pelvic bodies was not of necessity a serious lesion, but that healing could be expected in an ordinary way as after a fracture of a bone of an extremity; that the really serious lesion was the complication of injuries to the bladder, the intestines or the vascular system; that injuries to the bladder were more likely to occur when the fracture had been due to anteroposterior compressive force; that injuries to the urethra were more apt to occur when the fracture was due to transverse compressive force; that the present indications were to open at once the space of Retzius and make a reverse catheterization and perineal section with lateral incisions in the groin and perineum for drainage of all areolar planes. With this technique the mortality should be reduced to about 33 per cent, as against 60 per cent.

DISCUSSION

DR. ARPAD G. GERSTER, of New York: I have in my experience a case of fracture of the female pelvis on the left side in which there was no injury of the urethra, although it was compressed to such an extent by a solid blood clot that retention followed and had to be relieved for 15 or 16 days by the use of the catheter. The woman recovered, there was no other injury present. Another case was one in which there was fatal hæmorrhage following fracture of the pelvis. Post-mortem revealed extensive laceration of one of the common iliac arteries and subperitoneal hæmorrhage.

ON MOMBURG'S METHOD OF ARTIFICIAL ANÆMIA BY SUPRAPELVIC CONSTRICTION

DR. ARPAD G. GERSTER, of New York: In reporting a successful case of his own, the author presented the history and present status of the method of obtaining artificial anæmia of the pelvis, its organs, and of the lower extremities by the elastic constriction of the abdominal aorta.

CHICAGO SURGICAL SOCIETY

REGULAR MEETING HELD APRIL 8, 1910, WITH DR. ARTHUR DEAN BEVAN, PRESIDENT, IN THE CHAIR

DR. E. WYLLYS ANDREWS, read a paper entitled "Laparotomies upon the Knee-joint for Fractured Patella, and a New Method of After-treatment."

DISCUSSION

DR. WILLIAM E. SCHROEDER: I have had occasion to show a number of cases at different times after wiring the patella. I think the method proposed by Dr. Andrews is unique. He is to be complimented on the excellent results he has obtained. Since we have gotten rid of the wire idea it is marvelous to see how we can invade the knee-joint under antiseptic precautions, rather than follow the detailed method of any one man, for the reason that first, sometimes the superficial fascia is not torn. The last case I operated on, several weeks ago, was a case of that kind, the patient having a fracture of the patella. That was a revelation to me because I had supposed that the fascia was always torn, but it was not. At other times when one gets into the joint he finds conditions much worse than anticipated. Shreds of fascia hang between the two fragments; the knee-joint is full of blood, and sometimes the tears in the transverse and lateral ligaments are extensive. At other times, they are not. Treatment of the joint should be undertaken according to the extent of the injury. I have never had a single bad result from suturing the tendon. I shall be very glad to try the method outlined by Dr. Andrews, because it is simple and along the right lines. I merely wish to say this, however, in defense of other methods, that suturing the quadriceps tendon and patellar ligament with a circular suture of silk or kangaroo tendon will answer the purpose. It can be accomplished in a few minutes with needle or with bone drill with a hole in it, and with the supplementary sutures, as advocated by Blake years ago, through the lateral ligament. This would be sufficient to accomplish the object in view. I have made it a rule to cut off the shreds that Dr. Andrews mentioned, but possibly it may be better to leave them there, but the reason I mention this is because my results have been uniformly good. It was stated some time ago that we should wait for a definite period until the knee-joint develops immunity. The immunity bug got into us for a while. I have operated on fractures of the patella at sight, in some cases in nine days, in other cases two days, and in other instances, within a few hours, and have had over forty-five cases without a single bad result. The suggestion to use massage and early passive motion I approve of very decidedly. I think we have been keeping these joints immobilized too long.

DR. CHARLES DAVISON: I do not think the method of suturing is the principal thing in Dr. Andrews' paper, but the after-treatment. We have all been suturing in a manner similar to that he has described, but most of us have confined these joints for some time afterwards. I have confined the knee-joint until the superficial wound has healed, and have had a certain amount of trouble in getting free movement but much less than under the old method of long fixation. Restoration of function is the prime object of treatment. If by starting passive motion from the beginning we can save any ankylosis, then it is a great advance in the surgery of these parts. Even fixation for two weeks does produce a certain amount of ankylosis, and a certain proportion of cases get into the habit of refracturing the patella. When we get pretty good motion, these patients fall and refracture the patella, not in the same line perhaps, but in a different place, showing it is not a lack of good union, but of poor protection of the joint by lack of good, free motion.

I think the after-treatment that has been described is a decided advantage,—it is perfectly feasible, and I shall try it in my next case.

DR. ARTHUR DEAN BEVAN: To my mind Dr. Andrews' work is very important. I have never employed his method of application in any case, but it impresses me as being scientific and rational, and I am quite sure that we have a good precedent for such treatment.

I was very much impressed by the report of Kummell at Budapest this summer of his last one thousand cases of laparotomy, in which he had tried a very different proposition from the ordinary methods which he had pursued before, in that he got his patient up and about and put strain upon the tissues after the laparotomy incision was closed very early. He made a careful study of this last thousand cases in which this strain had been placed upon the sutures and tissues, as compared with his previous one thousand cases. He found not only that he had fewer complications in a

general way in the way of pneumonias, as one might hope for, and cases of pulmonary embolism and thrombosis, but he found by careful analysis he had much better wound repair; that the wound repair was stronger; that it was more complete, and that it was complete at an earlier date. That it was followed by fewer hernias than in cases where no strain and no tension was put upon the sutures at an early date.

I think Dr. Andrews' choice of the word "laparotomy" when he makes this comparison in considering his after-treatment is a very fortunate one. I am rather inclined to think that the work will be generally followed out. I saw one or two of Dr. Andrews' cases, and I have been very favorably impressed with them.

There is one item of technique to which my attention has been called, and which is very well shown in the X-ray which Dr. Andrews exhibits. I find in a number of these cases where I employed the suturing of fibrous structures I had a little wedge-shaped space between the fragments, which was shown by the X-ray, and sometimes quite easily determined by the palpating finger. On that account in our recent cases we have also made at least one drill hole through the bone and put a catgut suture through the bone to prevent any separation of the bony fragments themselves.

DR. ANDREWS (closing the discussion): The delay of operation with the hope of establishing immunity did not appeal to me *a priori* but after a discussion which was reprinted in the English journals I found that Mansell, Moullin and one or two others of the best men in England agreed, and their statistics proved, that a greater number of infections in operations occurred on the day than in operations done after a slight period of reaction, say five or six days. The stopping of acute hæmorrhage, the beginning of absorption and the assumed immunity, or whatever factors there are present, seem to have been proved by statistics; so in badly contused knees I have followed that practice since reading that discussion, and have operated in from five to seven days.

DR. HERMAN L. KRETSCHMER read a paper by invitation entitled "The Value of the Shadowgraph Ureteric Catheter in the Diagnosis of Obscure Lesions of the Urinary Organs." (See p. 598.)

DISCUSSION

DR. MAX REICHMANN was asked to open the discussion. He said: The report of cases by Dr. Kretschmer, and especially the exhibition of his Roentgenograms, were very interesting to me.

I should like to call his attention to one point, namely, the use of the ureteral bougies made by Müller in Hamburg. These bougies are made from a mixture of rubber and lead, are therefore very opaque, and the danger of breaking is reduced to a minimum. The differential diagnosis between those shadows which appear so frequently in the pelvis, especially in persons over forty, and concrements in the ureters, is only possible by the use of ureteral bougies, and I think I was the first one who published a case in which this method of differentiation was used.

For the Roentgenographic diagnosis of a displaced kidney, I should prefer to use the method of Voelker and Lichtenberg, the so-called pyelography, that is, injection of a weak solution of protargol into the pelvis of the kidney by means of a ureteral catheter.

DR. WILLIAM T. BELFIELD: Dr. Kretschmer has indicated the different ways in which the shadowgraph catheter aids diagnosis. It is also true that this catheter has, at different times, led to a mistake in diagnosis. Thus the shadowgraph catheter has shown a stone in the course of the ureter, which on operation proved to be a concretion in the appendix. We can readily understand that there are other objects also than appendical concretions which could be overlaid by the catheter, causing a mistake in diagnosis. For instance, the seminal vesicle, lying in contact with the ureter at one point, might be the subject of a tuberculous concretion mistaken for a ureter stone. But with the more extensive use of this method of diagnosis these sources of error will gradually be eliminated. This method is certainly an addition to our diagnostic resources. This method dates back beyond 1901 by the way, having been used by Tilden Brown, of New York, in 1898, and by Fenwick of London about the same time.

DR. ARTHUR DEAN BEVAN: I quite agree with Dr. Kretschmer that this means of diagnosis is a very important one, and I know that in half a dozen cases in my work it has been of very great service. It is indispensable. I operated yesterday on a case which illustrated this very well. The patient was a man, forty years of age, who had a very severe pain on the left side. He was seen by a very competent general practitioner, who called in a surgeon. On examination it was found that the man had a lump on the left side of the abdomen; some temperature; the urine was quite normal; the possibility of some kidney lesion was canvassed, but was excluded because of the fact the urine was found normal. An operation was made in the middle line in front. A large retroperitoneal abscess was found and drained up high above the umbilicus. This continued to excrete pus and urine for some time. That case could have been

cleaned up with the ureteral catheter and with the shadowgraph catheter, as it proved to be a case of stone obstructing the pelvis of the kidney, with resulting pyonephrosis.

I regard this work as being very much in the same line as X-ray work, and that it should be in the hands of some man who is an expert in the work, and who is devoting his entire time, or a large amount of his time, to it. I do not think any of us who are in general surgery, and who are so tied hand and foot by the many problems that confront us in general work, are as competent to do good catheterization of the kidneys or ureters as are the men who are devoting their time to this work. On that account, I believe it will remain and should remain largely in the hands of experts.

One thing I should say in regard to the two cases which Dr. Kretschmer reported as coming from my service, and that is a word in regard to the technique. I think the technique followed in both cases of misplaced kidney and the one in which the stone was in the ureter, is a desirable operative technique in the majority of cases, and that is a muscle-splitting incision very much like an appendix incision in which the perineum is not divided, and in which the muscle-splitting is carried well to the middle line, this being done by blunt tearing and separation of the fibres of the muscles without any incision so that, for instance, the sheath of the rectus is split practically to the middle line. You know below the umbilicus or a little below it the three abdominal muscles unite and form a single layer in front of the rectus and in most of these cases of stone in the ureter the incision should be made, as a rule, below the umbilicus so that it is readily split as far as the median line and a huge opening can be obtained in this way without making the oblique incision which is usually favored by the Germans, and by stripping the peritoneum to one side one can readily expose the ureter over its entire course, except that portion of it below the bladder, and the one point I should like to emphasize in technique is this: that it is a good plan to leave the catheter *in situ* at the time of the operation in these operations for stone in the ureter, as you can find it readily with a fused wire in it. You can pick the ureter up on a couple of hooks so that the ureter stands out in the incision with the wire in place, and it is much easier to incise the ureter, remove the stone with the wire in position, and make closure of the ureter with the wire still in place. It adds a good deal to the ease of the operation. In removing a stone from the displaced kidney in front of the promontory of the sacrum we find no difficulty by the same muscle-splitting incision in reaching the stone and removing it. We were able to do here a simple pyelotomy.

One word in regard to the technique for the removal of stones low down in the ureter to the base of the bladder, and that is this: I am rather inclined to think that in many cases these can be operated on much better through the perineum. Recently we have had a satisfactory case in which a stone of fair size was in the lower end of the ureter, right under the bladder. We made the old-fashioned left lateral lithotomy incision except we did not cut into, but down to, the prostate, and then by blunt dissection followed along the prostate and seminal vesicles to the ureter, where we could feel the stone by palpation, nick the ureter over the stone with a pair of scissors, which was closed, and then stretch the opening with a pair of artery forceps and remove the stone in this way.

In regard to the bodies which we find so frequently in the pelvis, there has been a good deal of dispute. There is no question whatever in my mind but what in almost all cases they are centers of ossification in the pelvic ligaments. A few well authenticated cases have been reported where these bodies were phleboliths, but most of them are calcareous deposits found in veins and glands. The constant bodies we find at the tip of the spine and ischium are almost invariably centers of ossification in the pelvic ligaments. They do not occur in children. They do not occur until adult life, and they are quite common in the aged. Whether we can demonstrate then in all cases or not is a question, but the bodies we find so constantly are not phleboliths. Recently there have been reported several well authenticated cases where there were calcareous deposit in veins, but that I am quite satisfied is the exception and not the rule.

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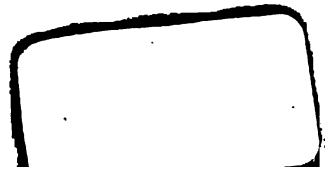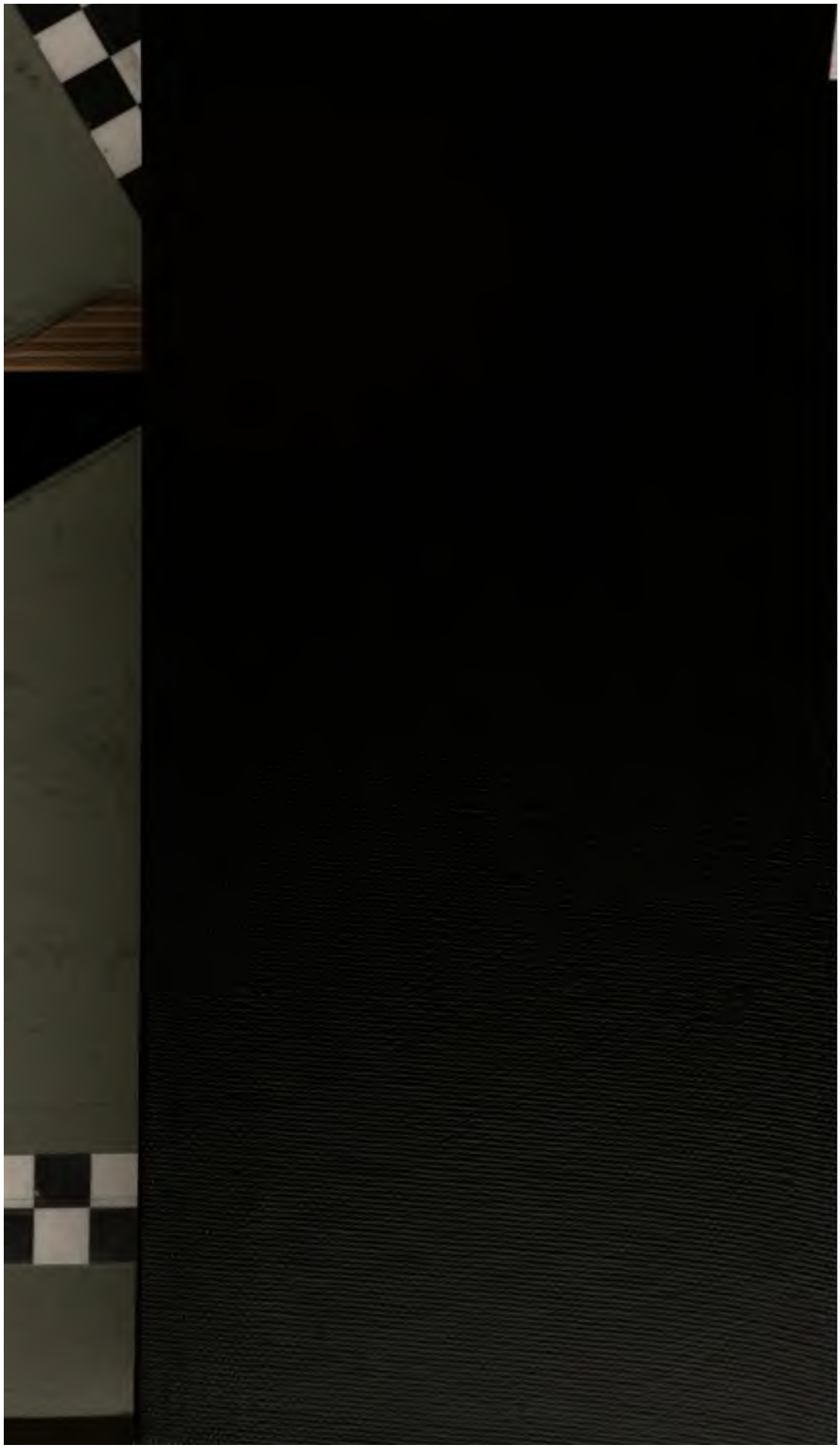
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